CHESTER

The Rebuilding, Betterment And Extensions of the South Pittsburg Water Works

Civil Engineering

C. E.

1909

THE REBUILDING, BETTERMENT AND EXTENSIONS OF THE SOUTH PITTSBURG WATER WORKS

BY

JOHN NEEDLES CHESTER

B. S. University of Illinois, 1891

THESIS

Submitted in Partial Fulfillment of the Requirements for the

Degree of

CIVIL ENGINEER

IN

THE GRADUATE SCHOOL

OF THE

UNIVERSITY OF ILLINOIS

1909

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

May 18, 1909

I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

JOHN NEEDLES CHESTER

ENTITLED THE REBUILDING, BETTERMENT AND EXTENSIONS OF THE SOUTH PITTSBURG WATER WORKS

BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE OF Civil Engineer

John P. Brooks
In Charge of Major Work

John P. Brooks
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Recommendation concurred in:

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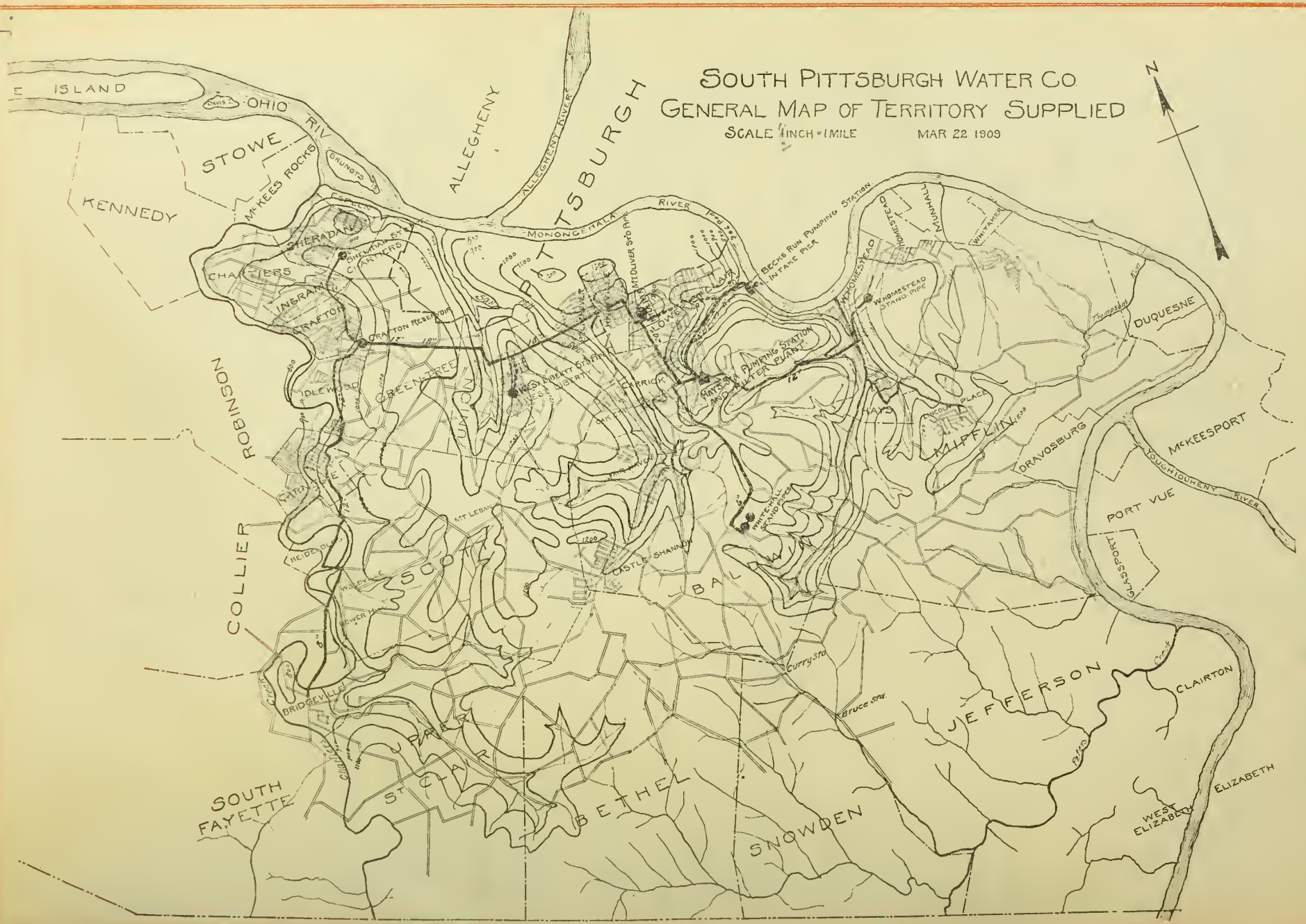

SOUTH PITTSBURGH WATER CO
GENERAL MAP OF TERRITORY SUPPLIED
SCALE 1 INCH = 1 MILE
MAR 22 1909
N
E ISLAND
OHIO RIV
STOWE
KENNEDY
McKEES ROCKS
GRUNOTS
ALLEGHENY
ALLEGHENY RIVER
PITTSBURGH
MONONGAHELA RIVER
STERRADAN
CHARTIERS
CRAFTON
CRAFTON RESERVOIR
IDLEWOOD
GREENTREE
ROBINSON
COLLIER
MT LEBANON
CASTLE SHANNON
SOUTH PARK
BALDWIN
MT OLIVER
BECKS RUN PUMPING STATION
INTAKE PIER
HOMESTEAD
WHITAKER
MUNHALL
DUQUESNE
WEST ELIZABETH
PITTSBURGH PUMPING STATION
FILTER PLANT
CARRICK
LOWER ST CLAIR
MIFFLIN
DRAVOSBURG
McKEESPORT
YOUGHIOGHENY RIVER
PORT VUE
GLASSPORT
CURRYS STA
BRUCE STA
JEFFERSON
CLAIRTON
ELIZABETH
SOUTH FAYETTE
ST CLAIR
BETHEL
SNOWDEN

South Pittsburg Water Company, first known as the St. Clair Water Company, was organized in 1894 and was the outgrowth of a dissatisfaction that arose in the territory bordering on South Side, Pittsburg, with the rates of the Monongahela Water Company, which supplied all the territory near the City of Pittsburg, South of the Monongahela River.

Mr. Jacob Schineller was employed as Engineer, and developed plans which consisted of taking water from a submerged crib or filter gallery, located in the bed of the Monongahela River, just above the inflow of Becks Run, and at this point a pumping station was constructed, wherein were installed two vertical 3,000,000 gallon pumping engines built by Henry R. Worthington, one a compound condensing low duty and the other a compound condensing high duty. A sufficient battery of Heine boilers to provide steam for these engines was installed; two receiving tanks, 50 x 66, were erected on the summit of Mt. Oliver, and a 20" steel main laid from pumping station to these tanks.

From this the pipe system, the backbone of which is shown on map, page 1, seemed to have been especially laid out with view to preempting as much territory as possible.

The pool level in the Monongahela River at Becks Run is approximately 706' above sea level. The summit of Mt.Oliver,

whereat the tanks are located, is at an elevation of 1220', which with the 50' additional in the receiving tanks, combined with the friction in the 20" main when pumping 7,000,000, (which was approximately the consumption at the time the writer became interested) provoked a total lift equivalent to 280# per square inch.

It will be noted from the map, page 1, that the territory supplied, which may be described as reaching from the Eastern extremity of West Homestead and Mifflin Township on the East, to beyond the Chartiers Valley on the West, and from the Southern line of the City of Pittsburg and the Monongahela River, on the North, to a line drawn below Bridgeville and Bruce's Station on the South, including within its limits over twenty-five Boroughs and Townships of the first and second class, embracing an area of over eighty square miles, containing a population, three years ago, of approximately 110,000 or about 1,400 per square mile, which population, however, is over 80% located within the Boroughs which have been shown on the map by the streets of which they are constituted.

From the contours on map, page 1, it will be noted that the region is semi-mountainous, being the blending out of the foot hills of the Alleghenies, elevations varying many times within a few hundred feet to from 800 to over 1200.

Contending, as this Company was, for control of a

territory against an older and financially stronger Company, under the strain of rate cutting and investments in long lines of pipe through lean territory, they soon confronted trouble; in fact, both Companies were losing money and finally wakened to their senses and by a compact divided the territory, by which division the Monongahela Water Company was confined to the territory within the City of Pittsburg, South of the Monongahela River, the Boroughs of Esplen, McKees Rocks and Stowe Township. This compact is still respected although the City of Pittsburg has since annexed considerable territory supplied by the St.Clair, now the South Pittsburg Water Company.

The policy of the Company, and the rough handling it received, had so lowered its finances by increasing its debt and consequent interest charges, and dissensions arising in the ranks, the plant gradually ran down till in the years 1903-4, the territory supplied by the St. Clair Water Company was without water service an average of two days per week.

The stockholders, however, being mainly residents of the territory, some of them influential politicians, the tide of opposition was for a time stemmed, but their conditions constantly grew worse until in the Spring of 1904 a Receiver seemed inevitable.

To avoid this, the principal owners cast about for a purchaser, which was found in the writer's employer, the American

Water Works & Guarantee Company, of which he was at that time Chief Engineer, and on him first devolved the duty of rehabilitating and keeping in operation the old plant, which, however, is not the subject of this thesis, so suffice to say that from the hour we took charge, no part of the territory was subsequently out of water, but these results were not accomplished without many sleepless nights and a vast expenditure of money for repairs and emergency devices.

During this time, however, we had besides the operation and construction work incident to forty other water works plants, the added burden of preliminary investigations leading up to and the crystallizing of the plans necessary to make of a broken down water works, a first class, up-to-date plant.

The original crib in the Monongahela River having been designed for three million gallons and the consumption being more than double that amount, we found the crib abandoned and the pumps taking raw water from the edge and bottom of the river, bringing in with it cinders from the slag piles of the furnaces above, and floating twigs and chips from the boat yard adjacent.

Their mains having extended into territory of a greater elevation than Mt. Oliver, they had, to deliver water to such points, erected numerous other tanks which were supplied by high service or booster pumping stations. Of these, there were, when

we took charge, three in number, with a demand for more than double that amount.

An 18" force main had been extended from the Mt. Oliver tanks through Beltzhoover, across two valleys and over as many hills, to the Chartiers Valley, where at an elevation of about 950' they built a two million gallon reservoir, and from this the lines were extended up and down the Chartiers Valley, through the Boroughs of Sheridan, Chartiers, Ingram, Crafton, Idlewood, Carnegie, Heidleberg, Woodville and Bridgeville, and the consumption in this valley had so increased that the slight difference between the water in the Mt. Oliver tanks and the tops of the hills over which this supply must pass, was insufficient to produce enough head to force the water demanded by the consumption into this reservoir, even when the tanks were full.

The consequence of this condition was that most of the large consumers, mainly coal mines, had been forced to provide other supplies or shut down, which latter was the case in many instances, there being nothing but surface water or mine drainage available, all of which was too acid for boiler use.

This provoking condition was intensified by the fact that the entire territory was originally underlaid with a vein of coal, 75% of which had been mined out, creating a drainage 200' below that destroyed any possibility of underground supply, hence when the Mt.Oliver tanks were without water, there was a pitiable

condition, not only sanitary, but the lack of water for domestic purposes had caused much suffering, and as before described, the quality was about as poor, when any was to be had, as could be, for the Monongahela at high water carries an excessive turbidity, and when low the acid frequently amounts to about seventeen grains of free acid per gallon, and with no means of clarifying or treating to reduce the acid, there was much of the year that the water supplied was unfit for domestic or laundry uses, and had to be neutralized before it could be introduced into steam boilers.

It was in this condition when our investigations began and our control took place.

But two sources of supply seemed available: -

First - The Monongahela River, which to be potable, must be filtered and at times treated to reduce acidity.

Second- A ground water supply, to be drawn from the old morain of the Ohio River in the vicinity of Brunots or Davis Island.

After a study of three months, we recommended both to our Executive Officers, but that the Monongahela supply be first developed and so installed that the entire territory could be supplied without the assistance of high service or booster pumping engines.

To do this required increasing the total head worked against by 100', and the plan, briefly outlined, was as follows:-

To abandon entirely the filter gallery or crib at Becks

Run, which had long since become practically useless by the silting over of the river, due to the pool, and to erect as far out as the Government would permit, an intake pier by which the height at which the water was taken could be governed.

To erect at a site christened Hays Station, over 300' above the level at Becks Run, sedimentation basins, filter plant and pumping station;

To connect this station with Becks Run and again with the Mt.Oliver tanks, which would be abandoned and in their place erected a 25 x 150' standpipe.

This, we calculated, would for years to come, provide sufficient head to supply the entire district and with water of a quality that would be acceptable.

For estimate on this work see page 1 of appendices.

The building of the second plant or the ground water supply from the Ohio River, we advocated being undertaken when the head provided by the 150' standpipe was insufficient to force through the 18" main, from Mr. Oliver to Crafton reservoir, the amount demanded by the consumption in the Valley, and then to proceed to erect either on Davis or Brunots Island, or along shore in between, (estimates being made three ways) a plant which would take water from the coarse gravel below to the extent of 5,000,000 daily, and force it through a main to be laid up the

Chartiers Valley and tied in with the mains in Sheridan and Ingram, utilizing the Crafton reservoir as a storage.

The along shore plan having been found impractical on account of inability to secure option on real estate, we were finally driven to one or the other of the islands mentioned, and it was deemed wisest, on account of the inability to procure fuel and the annual flooding of both islands, to plan to erect on Brunots Island only a low service pump station, as per page A of Drawings, which was to be operated by electricity generated at the high service pumping station on the shore, built at some convenient point along a railroad where fuel could be had for both the generating of power for low service station and the operating of high service station.

Estimates on cost of water supply and low service station will be found on page 3 of the appendices.

This was all that was accomplished in the way of this underground water supply and to date it has not been necessary to carry out this plan, nor are the indications such that it will be necessary within the next five years to come, and what our successors may conclude, time only will tell.

To the Becks Run Pumping Station, prior to our taking charge, had been added in the way of pumping machinery, a vertical 6,000,000 crank and fly wheel Allis machine and a vertical triple expansion Heisler. (See layout drawing page B)

These with the two Worthington's before described had been expected to keep up the supply, and while their capacity was sufficient, their strength, under the management and care they received, was totally inadequate, and the constant breaking of water end castings and the failure of force mains was the prime cause of the interruptions to the supply.

A careful examination of this machinery led to the conclusion that a division of the head was necessary in order to make the existing pumping machinery safely available, and it was this feature that permitted the going up Becks Run 12,000' in order to obtain sufficient available ground of a contour that would permit of building the proposed filter and pumping station and at an elevation that would practically divide the total head and relieve the strain on the Becks Run machinery.

This also permitted the substitution of a five million gallon water end on the high duty Worthington for the three million that before existed, and we further added two additional cylinders to the low duty compound Worthington, making of it a direct acting triple, then by removing a portion of the counterweight on the Allis, it was adapted to the lesser head. See page 4 for bids on this work.

The plan of the intake (See page C of drawings, also specifications and bids, pages 5 and 9 of appendices) provided, as per our original recommendations, that the water could be taken

practically at any height, and it was also necessary that the structure be strong enough to resist a 34' stage with ice, and the Government further imposed the condition that its stability be such as to permit coal barges to be tied to or back up against it. For subfoundations test holes revealed no substantial bottom. Consequently, piling were driven as per plan, page D, and a 30" main was laid from this to wet well within the pumping station.

Becks Run pumping station was rebuilt as shown by plan on page E, also specifications and bids, pages 10 and 17 of appendices.

Estimates for three different filter sites at different elevations were made, which pointed to the Hays site as the most practical. A contour map of this was prepared, condemnation proceedings filed at once on the ground and the work begun.

The original contours and general plan are shown by page F, from which the unacquainted will exclaim at first glance that this was not a very opportune site, but of the three sites that could be located, the contour of this permitted the lowest cost of filter construction, which with the benefits from the division of the head, offset the long pipe lines to reach it.

It will be noted that we were confined on an East and West direction by two streets. It further became necessary to change an East and West street, hewing out a new location for it from the solid rock between main structures, the coagulant house

and wash tank.

It was decided by the Directors that the designs of the filter plant and pumping stations should be such as to accommodate an ultimate 20,000,000 capacity, but that where practical, the immediate construction should stop at 10,000,000.

The 24" force main coming from Becks Run was therefore increased to 30", as was the discharge main upon our own property or station site, on account of the narrowness of the road and otherwise cramped condition.

The first work on this plant was the construction of the sewer, as shown through the center of plan, page F, the necessity of which was to care for the maximum storm drainage from about seven hundred acres above, and was further so constructed as to be utilized for draining sedimentation basins and carrying away filter wash, air pump discharge, and finally, taking care of the ashes of the boiler room. See specifications covering same, page 18 of the appendices.

The sedimentation capacity was fixed at a maximum of 3,000,000 gross, to provide for water remaining there three hours at times of 20,000,000 consumption.

The sedimentation facilities or basins are shown in plan and longitudinal section on page G.

The plan was such that they could be ordinarily operated in series, the water being brought in at the upper end, through

twelve vertical pipes or fountains, which provided some aeration, and a 3' drop of the water was arrested by a wooden raft, from which it trickled into the upper end of the settling basin, the coagulant having been introduced as it passed the coagulant house.

But one pass was provided and horizontal currents or stratifications are prevented by a single vertical baffle extending down 10', the water then wiers over the center wall, then under another baffle, and is finally taken out through six down spouts attached to 36" main leading to the filters.

On the center wall dividing the two basins, it will be noted, ability is provided to introduce the water to the lower basin or to take the water out of the upper basin, so to clean the upper basin the water is dropped one foot, introduced at the upper end of the lower basin and taken out at its lower end.

To clean the lower basin the plan is similar.

The plan of the bottoms of these basins, the grades, sluice ways, sumps, etc., are such that four to six feet of sediment can be removed within an hour after the water is drained off, and facilities for pumping out and to the filters, down to within 5' of the bottom, have been provided to prevent wasting contents at time of cleaning.

The arrangement of the bottom to facilitate cleaning is further better shown on three cross sections, page H.

From the sedimentation basins the water is conveyed

through a 36" cast iron conduit to filters, which consist of fourteen reinforced concrete tubs, of 1,000,000 capacity each (375 sq.ft.) which are shown in plan and cross section on page I, in general plan on page J, and in further cross section on page K, and in pipe and control detail on page L, and the superstructure of which is shown in elevation on page M.

Beneath the filters is constructed a vaulted clear water basin having capacity of some 400,000 gallons. This is shown in cross section on page I, and in longitudinal cross section on page K.

From the clear water basin the water passes through two 30" pipes into a sump under a portion of the engine room. The flow is controlled by two float valves and further protected by gates. This sump is shown in cross section drawing, page N, and appears in plan on page O.

The above plan and cross section also show in detail the pumping engine and boiler installation.

The pumping engine installation consists of three 5,000,000 horizontal triple expansion condensing engines, with room provided for the installation of two more, so that in the ultimate capacity of 20,000,000 there will be one spare.

The boiler installation consists of three 300 H.P. water tube boilers with superheaters.

Bids and specifications for these pumping engines are

shown on pages 21 and 26 of appendices.

It will be noted that a feed pump and heater has been provided for emergencies, and in the space provided under floor in front of the boilers, a shop has been built.

The ash disposal is accomplished by lifting a plate in the floor and raking the ashes into a chute, turning stream of unfiltered water on each end of same, ehich washes them into sewer from which they are eroded when the filters are washed, and deposited on the flats of the stream below.

Plan on page O also shows coal house, which is shown in detail on page P.

All concrete work, basins, filters, clear water receptacle, foundations, substructures, etc., were built by days' labor by a construction force organized for that purpose.

The stone for concrete was quarried from the hill on the Southeast side of the Company's property, from whence it was carried by hand down hill to crusher and from thence elevated to bins, from which it was dropped into hand cars standing on stub tracks near mixers, which again dumped into cars on tracks with a down grade to highest point of concrete work. The sand and cement being hauled up and stored at elevations above the mixers, all went by gravity.

The superstructures were built by contract. The erection of all machinery, except boilers, was done by days' labor,

as was the installation of all pipe work.

We were given word to proveed with this work on May 1st, 1905, when the plans and simultaneously the construction was begun; all concrete work was complete by November 1st, the main superstructures by January 15th, and the plant was put in permanent operation July 14th, 1906.

On the hill adjacent, and well above the settling basins, was erected a coagulant storage and dissolving house, and filter wash tank. This coagulant house is shown in plan, elevation and cross section on page Q. For specifications and bids see pages 27, 33, 34 and 37 of the appendices.

From the pumping station the water leaves first through a 30" steel main, (for specifications see page 44 of appendices) which extends sufficiently up the hill to cut the friction down to approximately 120#, and from there through a cast iron main to the standpipe, which is shown in plan, elevation and detail on page R, and for specifications and bids see pages 38 and 43 of the appendices.

The detail cost of the plant promised in outline submitted the owners have thought best not to permit published but consent to my saying that it was in total within five per cent of the estimate.

We have prepared photographs of the exterior and interior of the Mays Station pumping and filter plant, which may be indexed

as follows:-

S shows view of Settling Basin and Plant from the East;

T shows view of Plant from the South;

U shows Plant from the West;

V shows Coal House and Wash Tank from the South;

W shows Interior of Filter House;

X shows Interior of Laboratory;

Y shows Interior of Engine Room;

Z shows Interior of Boiler Room;

ZZ shows Stand-pipe.

OPERATION

For operating, coal is obtained from Hays Mine of the River Coal Company, immediately adjacent, and indicated in general plan, page F.

The pit cars are shoved off to a side track and raised to the second floor by a hydraulic elevator, where provisions have been made for dumping through holes in this second floor into the lower compartment, from whence it is taken by industrial cars to the front of the boilers, first passing over a scales where it is weighed.

The following is the result of official duty test of one pumping engine:

DIMENSIONS OF PUMP

Diameter of each high pressure cylinder,	(2)	18"
" " intermediate pressure cylinder,	(2)	28½"
" " low pressure cylinder,	(2)	47"
" " High pressure piston rod,	(one at each end)	3¼"
" " intermediate pressure piston rod	(1 at 1 end)	3¼"
" " low pressure piston rod,	(2 at 1 end)	2-5/8"
" " Plunger,	(2)	19⅛"
" " plunger rod,	(1 at 1 end)	4¾"
Nominal stroke,		24"

GENERAL DATA

Duration of test - -	6 hrs.
Average temperature of water in sump -	52°
" " " " feed water -	105.62°
No leakage in feed water heater or condenser.	
Weight of steam used in cylinder -	40417#
" " " " " jackets of high and int.cyls.	2674#
Total weight of steam used in cylinders & jackets,	43091#
Reading of counter at beginning of test, -	794499
" " " " completion of test, -	805310
Average vacuum shown on gauge, -	24.41"
Average pressure shown on steam gauge, -	134.84#

DATA RELATING TO WORK OF PUMP

Area of plunger - -	298.648 sq.in.
" " one-half plunger rod -	8.860 " "
Net area of plunger, - -	289.788 " "
Average length of stroke, - -	2.017'
Total number of revolutions, -	10811
Average revolutions per minute, -	30.03
Average pressure as shown by gauge on discharge main,	185.8#
Above pressure reduced to feet, -	428.111
Vertical distance from floor to center of gauge on discharge main,	6.917'
Average distance of water in sump below floor level,	2.683'
Total head worked against by pump, -	437.711'
Gallons pumped per foot of stroke per revolution,	60.2

SLIPPAGE TEST

Water pumped as figured by computing quantity of water contained in sump by actual measurements - 8878.132 gal.
Revolutions of pump during slippage test - 75
Average stroke - 1.983'
Water pumped as figured from actual plunger displacement - 8953.275 gal.
Leakage through pump valves, - 75.143 "
Leakage past plungers during time of slippage test, - 1.77 "
Total slippage, - 76.913 "

RESULTS

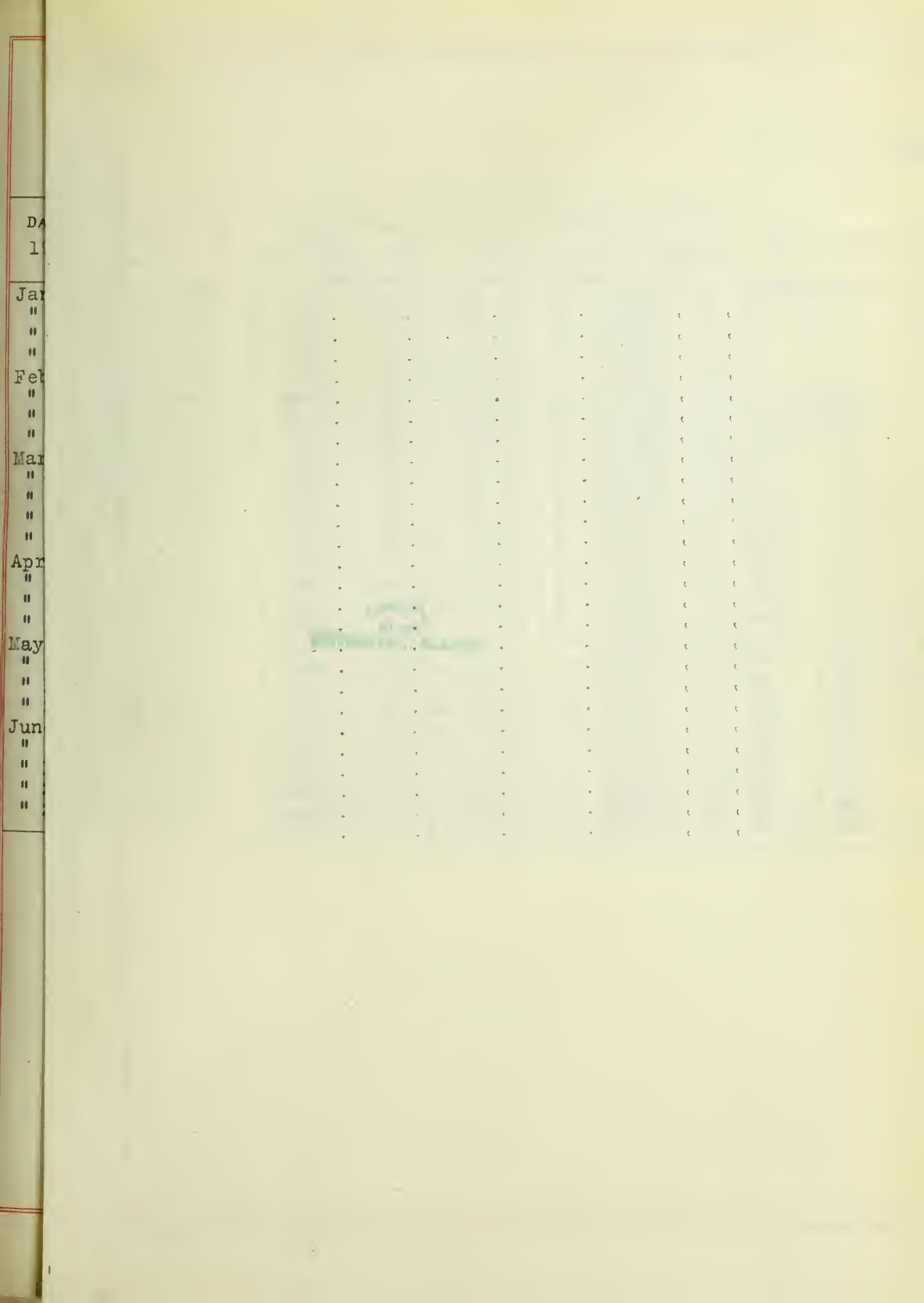
Capacity for six hours run - 60.2 x 2.017 x 10811 - 1312704.053 gal.
Rate of pumpage for 24 hrs. 5250816.212 "
Total slippage equals $\frac{76.913}{8953.275}$ - 9/10 of 1%.
Actual quantity of water pumped during the six hours of test allowing for slippage, 1300889.717 gallons
Rate of pumping for 24 hours with allowance for slippage - 5203556.868

Duty - $\frac{1312704.053 \times 8.33 \times 437.711 \times 1000}{43091}$ - 111074000 ft.lbs.
per 1000# of steam consumed by engine.

On pages 21, 22, 23, and 24 is tabulated the performance of the Becks Run Pumping Station, which covers all the coal consumed, and all the water pumped, and the results obtained therefrom.

On pages 25, 26, 27 and 28 is tabulated the performance of the Hays Pumping Station, similiarly made up and including necessary fuel to light and heat the station and provide filter wash water.

The better performance of a lower type of engines at Hays Station over the higher class at Becks Run we attribute to the more compact design of the station, shorter steam pipe, consequent less radiation and steam loss, and further the provision of superheated steam at this station, where none is available at Becks Run, and the performance at this Hays Station we have found to be an example for any station of its capacity in the Country.



BECKS RUN.

DATE 1907	GALLONS PUMPED		Total Cost of Fuel	Pounds of Coal	Cost of Fuel Per Million Gallons	Pounds of Coal used in Raising a Million Gallons 100 Feet	PUMPS AND HOURS IN USE					DUTY	Cost of Labor	Cost of Oil	Cost of P & W	Total Cost Per 1000 Gal
							Worth.	Worth.	Allis	Heisler	L.D.G.					
Jan.5	58,637,800		390.56	335,970	6.65	1,520		76	156	97	28	54,700,000	159.65	20.54	15.04	.010
" 12	61,294,600		394.20	339,270	6.43	1,474		72	168	71	92	56,800,000	181.05	20.12	6.14	.009
" 19	61,330,900		397.49	342,270	6.48	1,480		139	149	88	45	56,200,000	185.20	21.94	9.96	.01
" 26	60,948,600		390.03	335,490	6.40	1,468		8	168	161	9	56,300,000	154.40	21.88	26.36	.009
Feb.2	68,084.200		484.87	421,700	7.12	1,644		102	158	162	20	50,600,000	131.00	21.10	.4.94	.0095
" 9	71,575,800		463.42	402.200	6.46	1,488		132½	145	153½	63½	55,900,000	168.55	21.39	9.63	.0091
" 16	60,832,800		383.69	329,716	6.31	1,437	2	116	159	108	43	57,900,000	131.25	19.60	9.79	.009
" 23	54,743,687		336.37	286,702	6.14	1,397	59	40	116	53	2	59,800,000	130.45	17.92	5.17	.009
Mar.2	51,702,900		315.11	267,367	6.09	1,375	53	36	158	47		60,600,000	136.50	16.16	3.53	.009
" 9	50,000,900		303.84	257,130	6.07	1,368	61		167	52		60,900,000	132.84	16.54	3.40	.009
" 16	52,634,400		322.23	273,851	6.12	1,383	49¾		159	109		60,100,000	164.87	16.43	.65	.0097
" 23	66,035,100		420.47	363,153	6.36	1,464	100		152	149		56,900,000	150.14	21.09	6.90	.009
" 30	55,213,000		242.35	292,136	6.20	1,404	105½		156	82½		59,200,000	164.37	17.89	13.21	.010
Apr.6	51,694,500		277.77	233,421	5.37	1,200	15		168	106¾		69,400,000	127.58	17.16	.65	.008
" 13	53,416,100		301.02	254,569	5.63	1,266	31	21	159	110½		65,600,000	147.42	22.18	14.41	.009
" 20	46,709,700		269.77	226,151	5.72	1,285	7½	45	159½	61		64,700,000	139.90	18.91	7.23	.009
" 27	52,647,400		336.07	286,430	6.39	1,447	6	105½	157¾	45		57,500,000	164.41	16.42	4.38	.010
May 4	53,622,500		328.10	279,179	6.11	1,384	25	96½	152¼	38½		60,200,000	139.41	22.13	9.28	.009
" 11	53,720,400		318.82	270,740	5.94	1,340		134	162½	18		62,000,000	154.70	21.50	4.40	.009
" 18	54,591,800		345.02	294,568	6.31	1,437	8	127½	160	42½		57,900,000	119.61	20.94	11.58	.009
" 25	54,306,900		320.05	271,864	5.89	1,332	18	107½	164½	3½		62,500,000	141.89	20.28	7.71	.009
June 1	50,388,900		372.00	319,097	7.38	1,687	97½	136	82½	25		49,500,000	130.74	22.11	3.41	.0010
" 8	47,797,900		389.16	334,691	8.14	1,862	167	168		47½		44,800,000	143.82	23.53	4.69	.0010
" 15	48,977,900		402.75	351,587	8.21	1,910	167	166		61		43,600,000	121.81	21.19	1.33	.0010
" 22	51,342,400		448.41	388,552	8.74	2,013	167	164		118	3	41,300,000	126.02	22.78	9.96	.0010
" 29	60,396,800		414.55	357,500	6.85	1,574	32	135	143	82	25	52,900,000	113.61	24.55	8.80	.009

BECKS RUN.

DATE 1907	GALLONS PUMPED	Cost of Coal Per Ton	Total Cost of Fuel	Pounds of Coal	Cost of Fuel Per Million Gallons	Pounds of Coal Used in Raising a Mil. Gal. 100 Feet	PUMPS AND HOURS IN USE					DUTY	Cost of Labor	Cost of Oil	Cost of P & W	Total Cost Per 1000 Gal
							Worth	Worth	Allis	Heisler	L.D.G.					
July6	51,755,800		335.20	285,640	6.47	1,484	7	75	168		41	56,900,000	113.61	19.41	7.13	.009
"13	52,960,200		370.66	317,869	7.00	1,597	5	121	144	68		52,200,000	116.09	23.46	7.58	.0098
"20	54,676,400	1.55	292.92	263,478	5.36	1,278	42	88	163	16		65,000,000	148.85	22.65	6.29	.0080
"27	60,794,200	1.55	279.85	306,812	4.60	1,350	38	165	160	19		62,000,000	138.26	24.02	2.76	.0070
Aug.3	53,205,400	1.55	221.65	286,000	4.16	1,430	3	80	168	38		58,200,000	135.01	20.59	4.38	.0070
"10	50,483,000	1.66	204.45	248,000	4.04	1,305	45	66	156			63,800,000	151.35	18.04	6.21	.0076
"17	52,452,700	1.66	185.65	223,680	3.53	1,135	63	36	153			73,500,000	180.89	15.24	11.16	.0070
"24	56,434,000	1.66	202.52	244,000	3.58	1,151	38	80	165			72,200,000	150.09	18.30	3.88	.0064
"31	55,265,300	1.66	209.22	252,080	3.78	1,211	49	60	166			68,700,000	149.91	17.44	11.10	.0070
Sept7	50,264,800	1.66	196.71	237,000	3.91	1,254	36	50	158	5½		66,500,000	143.31	16.04	10.81	.0070
"14	51,641,100	1.62½	200.68	247,000	3.89	1,273	49½	51½	168			65,400,000	133.36	16.24	1.50	.0068
"21	53,135,200		206.38	254,000	3.89	1,273	85	28	148	12		65,400,000	173.29	16.87	1.80	.0075
"28	52,844,100		210.44	259,000	3.98	1,301	74	10	158			63,900,000	180.17	16.90	9.17	.008
Oct.5	49,464,800		188.50	232,000	3.81	1,247	36	46	160			66,800,000	135.64	13.38	1.50	.007
"12	51,209,000		212.88	262,000	4.14	1,356	58	27	168			61,200,000	159.09	13.28	2.90	.007
"19	50,505,600		196.63	242,000	3.89	1,273	56	62	155			65,300,000	170.12	14.42	1.50	.006
"26	50,587,400		186.06	229,000	3.67	1,205	83	15	167			69,200,000	165.57	13.86	1.20	.0067
Nov.2	48,659,900		186.06	229,000	3.84	1,251	61		168			66,600,000	174.32	12.04	.76	.0067
" 9	47,716,600		177.12	218,000	3.71	1,220	24	22	168			68,500,000	175.07	12.32	5.96	.0077
"16	47,927,300		186.06	229,000	3.88	1,305	60	39	141			65,500,000	165.84	13.82	1.20	.0076
"23	50,111,600		190.94	235,000	3.79	1,247	78	29	161			66,700,000	159.07	12.47	21.76	.0077
"30	45,967,500		164.94	203,000	3.58	1,173	17	55	153			70,900,000	159.57	11.13	12.40	.0077
Dec. 7	47,665,900		190.13	234,000	4.00	1,300	31	35	166			63,900,000	158.97	11.34	5.15	.0077
" 14	48,049,500		191.76	236,000	4.00	1,311	20	57	164			63,900,000	178.06	12.32	9.16	.0081
" 21	53,916,400		225.23	277,200	4.17	1,365	69	55	163			60,900,000	163.37	14.08	6.80	.0076
" 28	52,867,100		254.48	313,200	4.81	1,574	57	47	168			52,900,000	159.22	14.24	1.20	.008

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BECKS RUN.

DATE 1908	GALLONS PUMPED	Cost of Coal Per Ton	Total Cost of Fuel	Pounds of Coal	Cost of Fuel Per Million Gallons	Pounds of Coal Used in Raising a Million Gallons 100 Feet	PUMPS AND HOURS IN USE				DUTY	Cost of Labor	Cost of Oil	Cost of P & W	Total Cost Per 1000 Gal.
							Worth	Worth	Allis	Heisler					
Jan.4	47,835,900	1.62½	225.39	277,400	4.71	1,541	64	31	164		54,100,000	152.72	13.07	3.75	.008
" 11	43,571,200	1.62½	192.33	236,710	4.41	1,440	15	47	164		57,600,000	164.45	12.08	7.76	.0086
" 18	47,932,600	1.62½	207.91	255,898	4.34	1,421	34	50	165		58,600,000	154.75	13.50	.95	.008
" 25	45,493,400	1.62½	218.86	269,371	4.81	1,584	110	123	68½		52,800,000	166.57	13.30	6.78	.0089
Feb.1	58,089,400	1.62½	278.88	343,240	4.80	1,570	106	19½	168		53,000,000	170.19	17.04	9.93	.008
" 8	58,367,700	1.62½	277.15	341,109	4.74	1,550	125	31	165		53,400,000	163.37	18.30	8.31	.008
" 15	55,256,700	1.62½	231.06	284,387	4.17	1,366	95½	41	160		51,000,000	163.77	15.48	9.77	.0076
" 22	55,164,100	1.62½	233.76	287,705	4.23	1,382	82½	92½	168	10	60,000,000	170.97	15.82	7.62	.0078
" 29	46,070,600	1.62½	197.85	243,508	4.29	1,408	42	30	162		59,200,000	175.32	12.11	5.12	.0085
Mar.7	46,052,900	1.62½	218.20	268,545	4.73	1,550	41½	39½	150		53,500,000	163.76	12.11	6.37	.0087
" 14	43,420,400	1.62½	186.17	229,132	4.29	1,404	17½	25½	168		59,300,000	174.62	10.08	6.37	.0087
" 21	49,926,600	1.62½	205.77	253,251	4.12	1,350	73½	28	156		61,700,000	174.50	12.60	1.37	.008
" 28	43,245,500	1.62½	169.68	208,838	3.97	1,286	3	32	168		64,900,000	162.12	11.34	1.54	.008
Apr.4	42,922,400	1.62½	165.61	203,827	3.85	1,270	12	22	168		66,000,000	162.12	11.03	7.62	.008
" 11	41,513,600	1.62½	162.55	200,060	3.90	1,284	17	18	168		65,000,000	165.49	10.99	6.37	.008
" 18	41,667,800	1.62½	167.92	206,665	4.02	1,318	32	24	157		63,200,000	163.37	11.97	21.37	.0088
" 25	48,193,200	1.62½	184.44	227,001	3.82	1,252	37½	48	168		66,500,000	162.27	13.30	3.87	.0076
May 2	42,242,000	1.62½	170.24	209,522	4.03	1,320	31	17	164		63,100,000	156.17	12.04	1.37	.008
" 9	40,784,500	1.62½	169.76	208,937	4.16	1,362	14	18	165		61,100,000	155.47	11.76	1.37	.008
" 16	42,686,100	1.62½	162.85	200,435	3.81	1,248	26	27	168		66,600,000	155.47	13.72	1.37	.0079
" 23	43,351,200	1.62½	172.61	212,447	3.97	1,301	37	26½	163		64,000,000	155.47	13.44	6.37	.0087
" 30	46,113,800	1.62½	174.39	214,646	3.78	1,238	50½	22	168		67,300,000	155.47	13.44	2.40	.0075
June6	44,176,600	1.62½	181.66	223,581	4.10	1,345	39	29½	162		61,900,000	155.47	14.84	6.18	.008
" 13	49,682,900	1.62½	206.60	254,274	4.15	1,365	61	40	168		61,200,000	153.62	14.70	3.87	.0077
" 20	47,329,000	1.62½	193.78	238,514	4.09	1,340	50	52	163		62,100,000	155.47	15.36	11.37	.008
" 27	49,726,300	1.62½	209.35	257,658	4.21	1,378	56½	54½	168	3	60,400,000	157.27	15.61	7.62	.008

BECKS RUN.

DATE 1908	GALLONS PUMPED	Cost of Coal Per Ton	Total Cost of Fuel	Pounds of Coal	Cost of Fuel Per Million Gallons	Pounds of Coal Used in Raising a Million Gallons 100 Feet	PUMPS AND HOURS IN USE				DUTY	Cost of Labor	Cost of Oil	Cost of P. & W	Total Cost Per 1000 Gal
							Worth	Worth	Allis	Heisler					
July4	50,614,500	1.62½	214.22	263,265	4.23	1,385	42	65½	168	8½	60,100,000	155.47	15.72	1.37	.0076
"11	48,134,200	1.62½	212.57	261,249	4.41	1,444	70	39	154		57,600,000	161.09	16.35	11.37	.0083
"18	53,946,900	1.62½	242.86	298,900	4.50	1,474	95	25½	168		56,400,000	155.46	16.10	1.37	.0077
"25	46,725,600	1.62½	196.21	240,012	4.20	1,366	50	28	163		60,900,000	155.54	14.77	3.67	.008
Aug.1	46,957,100	1.62½	191.03	235,111	4.06	1,330	65	22	154		62,600,000	155.47	14.16	1.18	.0077
" 8	47,846,200	1.62½	198.14	243,860	4.14	1,357	63	41	152		61,400,000	158.82	15.00	1.37	.0078
"15	46,448,500	1.62½	192.32	236,696	4.14	1,357	56½	30	167		61,400,000	155.47	15.98	2.17	.0079
"22	45,432,100	1.62½	185.94	228,845	4.09	1,340	42	33½	165		62,100,000	155.47	14.79	9.11	.008
"29	45,908,700	1.62½	192.03	236,342	4.18	1,369	36½	44½	168		60,800,000	155.47	15.07	5.36	.008
Sept5	47,409,200	1.62½	189.98	233,820	4.00	1,311	61½	35½	166		63,500,000	155.47	15.49	1.35	.0076
"12	47,700,200	1.62½	197.23	242,743	4.14	1,355	18	98½	160		61,500,000	155.47	15.44	1.35	.0077
"17	47,107,400	1.62½	197.45	243,012	4.17	1,454	52½	39	166		60,700,000	159.47	15.58	1.28	.008
"24	49,854,500	1.62½	203.51	250,465	4.07	1,335	20	95½	146		62,400,000	160.47	17.11	1.82	.0077
Oct.3	46,291,600	1.62½	205.83	253,323	4.44	1,455	61	31½	156		57,200,000	155.47	14.97	1.28	.008
"10	44,836,200	1.62½	195.65	240,805	4.36	1,396	23½	55½	168		59,600,000	155.47	13.49	1.80	.0082
"17	43,459,800	1.62½	174.68	214,988	4.01	1,288	41½	28	160		64,900,000	155.47	15.81	4.03	.0081
"24	43,852,800	1.62½	174.83	215,180	4.02	1,273	52½	14½	168		65,400,000	161.33	15.79	1.61	.0081
"31	43,856,300	1.62½	173.64	213,708	4.00	1,264	30	15	166		65,900,000	162.87	13.86	6.61	.0081
Nov.7	43,107,400	1.62½	175.29	215,737	4.06	1,300	27	16½	168		64,100,000	156.59	14.88	1.80	.0081
"14	43,750,400	1.62½	181.25	223,071	4.13	1,322	23	38	161		63,000,000	155.47	14.72	1.80	.008
"21	44,468,600	1.62½	191.61	235,825	4.30	1,378	53	18	165		60,100,000	165.97	15.18	1.61	.0084
"28	41,755,100	1.62½	181.60	223,501	4.34	1,388	20	22	165		59,900,000	168.97	14.26	1.93	.0088
Dec.5	41,400,600	1.62½	179.05	220,364	4.32	1,304	24	15	166		60,200,000	151.07	14.72	1.37	.0083
"12	40,131,600	1.62½	175.97	216,575	4.38	1,400	34		165		59,400,000	155.47	12.88	1.61	.0086
"19	39,444,900	1.62½	170.42	209,675	4.32	1,382	6	8	167	11	60,200,000	155.57	14.16	16.80	.0090
"26	40,031,700	1.62½	177.69	218,700	4.44	1,420	26	12	168		58,600,000	155.47	13.80	1.80	.0087

HAYS STATION.

DATE 1907	GALLONS PUMPED	Cost of Coal Per Ton	Total Cost of Fuel	Pounds of Coal	Cost of Fuel Per Million Gallons	Pounds of Coal used in Raising a Million Gallons 100 Feet	PUMPS AND HOURS IN USE. L. D. G.	L. D. G	L. D. G.	DUTY	Cost of Labor	Cost of Oil	Cost of P & W	Total Cost Per 1000 Gal.
Jan.5	45,687,600	1.35	149.45	221,420	3.27	1,375	95	122	110	60,800,000	137.00	13.22	1.02	.006
" 12	55,641,200		175.32	259,740	3.15	1,329	168	163	80	62,500,000	137.00	13.90	1.35	.005
" 19	52,650,200		167.93	248,790	3.18	1,337	111	145	80	62,200,000	137.00	13.72	.85	.006
" 26	53,914,600		176.21	261,060	3.29	1,373	110	140	86	60,700,000	137.00	13.72	1.64	.006
Feb.2	56,924,000		184.98	274,340	3.25	1,364	155	50	130	61,100,000	137.00	13.90	1.02	.0059
" 9	57,972,000		185.36	274,620	3.19	1,341	145	125	66	62,000,000	137.00	13.40	1.28	.005
" 16	54,117,600		171.81	254,540	3.18	1,332	24	160	152	62,400,000	137.00	13.31	.85	.005
" 23	49,219,200		160.90	238,370	3.27	1,372	146	95	95	60,800,000	137.00	12.40	.85	.006
Mar.2	46,866,200		162.62	240,920	3.46	1,455	160	122	48	57,200,000	137.00	12.40	1.02	.0066
" 9	46,048,800		152.43	225,835	3.31	1,394	136	50	150	59,800,000	137.00	13.40	1.02	.0065
" 16	49,454,400		159.92	236,915	3.23	1,354	110	110	116	61,400,000	137.00	13.22	.94	.006
" 23	53,206,800		171.67	254,325	3.22	1,354	70	161	105	61,600,000	137.00	13.40	1.02	.006
" 30	47,871,600		152.39	225,760	3.18	1,335	83	150	103	62,300,000	137.00	13.40	.94	.006
Apr.6	46,513,600		148.27	219,650	3.18	1,340	75	155	106	62,200,000	137.00	13.22	.94	.006
" 13	42,461,000		135.11	200,155	3.17	1,334	168	163		62,400,000	137.00	12.90	.77	.0067
" 20	39,159,600		129.02	191,145	3.28	1,383	150	55	85	60,600,000	137.00	12.40	.77	.007
" 27	41,478,200		132.71	196,610	3.19	1,350	160	110	40	61,900,000	137.00	11.90	.77	.0068
May 4	45,202,800		141.29	209,375	3.13	1,312	150	95	85	63,600,000	137.00	12.40	.68	.006
" 11	44,786,400		139.87	207,225	3.13	1,312	112	102	115	63,600,000	137.00	12.40	.77	.006
" 18	45,261,600		139.59	206,800	3.08	1,292	125	165	42	64,300,000	137.00	12.40	.85	.006
" 25	44,037,000		133.02	197,070	3.02	1,207	155	75	104	65,600,000	137.00	12.40	.68	.006
Junel	44,896,000		137.92	204,330	3.07	1,293	133	168	35	64,700,000	137.00	11.90	.68	.006
" 8	44,908,800		138.44	205,100	3.08	1,300	36	160	140	64,400,000	137.00	12.58	.85	.007
" 15	46,105,600		139.99	207.390	3.04	1,273	43	168	125	65,500,000	141.62	11.99	.94	.006
" 22	48,001,200		147.68	218,790	3.07	1,294	56	135	145	64,500,000	141.65	12.90	.94	.006
" 29	54,555,600		166.58	246,784	3.05	1,280	133	168	35	65,000,000	141.65	13.40	.94	.0059

HAYS STATION.

DATE 1907	GALLONS PUMPED	Cost of Coal Per Ton	Total Cost of Fuel	Pounds of Coal	Cost of Fuel Per Million Gallons	Pounds of Coal Used in Raising a Million Gallons 100 Feet	PUMPS AND HOURS IN USE. L. D. G.	L. D. G.	L. D. G	DUTY	Cost of Labor	Cost of Oil	Cost of P. & W	Total Cost Per 1000 Gal
July6	49,372,800	1.35	150.26	222,601	3.04	1,276	150	136	50	65,200,000	141.65	12.65	.68	.006
" 13	50,232,000		151.04	223,765	3.00	1,263	112	168	56	65,900,000	151.55	12.90	.77	.006
" 20	51,308,000		152.14	225,390	2.96	1,252	168	130	38	67,000,000	151.55	10.02	.85	.006
" 27	53,372,400		162.09	240,135	3.03	1,270	43	168	125	65,000,000	146.60	10.02	.77	.005
Aug.3	49,012,800		149.94	222,135	3.06	1,284	115	140	81	64,900,000	148.25	9.83	.85	.006
" 10	50,040,000		151.61	224,610	3.03	1,268	120	145	71	65,300,000	138.92	9.64	.94	.006
" 17	51,142,400		152.67	226,170	2.98	1,256	168	168		66,500,000	131.82	9.17	.68	.005
" 24	52,622,400		157.37	233,130	2.99	1,253	78	168	90	66,500,000	136.48	9.64	.77	.006
" 31	51,825,600		151.66	224,690	2.92	1,227	168	157	11	68,100,000	182.88	9.83	.77	.0066
Sept7	49,735,200		148.54	220,060	2.98	1,257	168	12	156	66,800,000	161.93	9.55	.77	.006
" 14	50,682,000		155.48	230,355	3.06	1,288	76	168	92	64,800,000	160.18	9.08	.68	.006
" 21	51 753 600		157.43	233,224	3.03	1,274	145	145	46	65,300,000	154.39	9.55	.85	.006
" 28	51,426,000		159.11	235,720	3.09	1,302	168	168		64,000,000	155.24	9.08	.68	.006
Oct.5	48,156,000		148.44	219,915	3.07	1,294	48	168	121	64,400,000	136.49	8.70	.68	.006
" 12	50,205,600		155.07	229,731	3.08	1,298	168	118	50	64,100,000	136.49	8.98	1.18	.006
" 19	49,700,400		153.08	226,790	3.07	1,294	168		168	64,400,000	136.49	8.70	.68	.006
" 26	49,411,200		154.10	228,295	3.12	1,312	18	150	168	63,700,000	136.49	9.55	1.48	.006
Nov.2	47,694,800		151.42	224,328	3.17	1,335	160	168	8	62,600,000	154.74	8.70	1.48	.006
" 7	46,264,800		144.45	214,333	3.11	1,217	120	72	144	68,500,000	143.79	8.70	2.28	.0065
" 16	47,272,800		150.22	222,555	3.12	1,236		164	168	67,100,000	147.44	9.08	1.48	.0076
" 23	46,747,200		144.85	214,598	3.10	1,211		160	168	68,700,000	146.47	9.08	1.28	.0065
" 30	45,277,200		139.67	206,915	3.08	1,203	153	163	10	69,200,000	139.21	8.70	1.80	.0065
Dec.7	47,070,800		147.31	218,235	3.12	1,212	168	168		68,400,000	136.49	9.55	.68	.006
" 14	46,800,000		143.80	213,035	3.07	1,190	86	140	110	69,500,000	136.49	8.99	.68	.0062
" 21	52,440,000		161.44	239,175	3.07	1,190	145	23	168	69,500,000	143.49	10.40	2.05	.006
" 28	51,667,200		157.95	233,995	3.05	1,180	6	162	168	69,900,000	155.49	10.12	.68	.006

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HAYS STATION.

DATE 1908	GALLONS PUMPED	Cost of Coal Per Ton	Total Cost of Fuel	Pounds of Coal	Cost of Fuel Per Million Gallons	Pounds of Coal used in Raising a Million Gallons 100 feet	PUMPS AND HOURS IN USE			DUTY	Cost of Labor	Cost of Oil	Cost of P & W	Total Cost Per 1000 Gal.
							L D G	L D G	L D G					
Jan.4	47,737 200	1.35	146.43	217,225	3.07	1,207	128	148	60	69,600,000	141.44	9.74	.68	.0060
" 11	43,567,200	1.35	139.24	206,275	3.19	2,040	128	40	168	67,000,000	136.49	9.08	.68	.0060
" 18	47,564,100	1.35	149.74	221,840	3.14	1,231	76	168	92	67,900,000	136.49	9.15	.85	.0060
" 25	45,009,700	1.35	143.42	212,475	3.19	1,260	108	160	60	67,000,000	136.49	9.46	.72	.0065
Feb.1	57.246,000	1.35	180.75	267,780	3.16	1,230	128	115	95	67,600,000	148.49	10.04	1.97	.0060
" 8	57,409,200	1.35	187.11	277,195	3.26	1,272		168	168	65,600,000	152.24	9.10	.68	.0060
"15	53,751,600	"	168.60	249,785	3.13	1,225	144	168	24	68,100,000	148.74	9.91	.85	.0060
"22	54,300,000	"	172.49	255,555	3.17	1,245	96	72	168	67,100,000	145.74	10.48	1.48	.0060
"29	45,659,800	"	149.03	220,795	3.26	1,270	24	168	144	65,400,000	136.49	8.34	1.48	.0065
Mar.7	45,881,600	"	148.73	220,345	3.24	1,260	160	136	40	66,000,000	136.49	8.34	.68	.0063
" 14	43,177,600	"	140.72	208,471	3.25	1,269	142	45	140	65,600,000	136.49	7.97	.68	.0065
" 21	49,770,900	"	162.86	241,277	3.27	1,274	148	168	20	65,300,000	136.49	8.73	21.93	.0060
" 28	43,068,300	"	136.67	202,470	3.17	1,236	120	130	75	67,300,000	136.49	8.17	1.88	.0066
Apr.4	42,170,400	"	135.10	200,150	3.20	1,250	130	150	45	66,800,000	136.49	8.16	.68	.0066
" 11	41,310,800	"	135.25	200,379	3.27	1,272	155	36	125	65,300,000	141.74	8.16	28.18	.0076
" 18	41,127,600	"	139.29	206,350	3.38	1,318	46	115	160	63,200,000	136.49	8.16	.68	.0069
" 25	45,068,400	"	144.21	213,650	3.19	1,248	115	90	120	66,700,000	135.62	8.92	.68	.0065
May 2	42,041,600	"	134.47	199,225	3.20	1,248	168	48	80	66,800,000	136.49	8.16	.68	.0067
" 9	40,116,800	"	127.78	189,305	3.18	1,242	40	168	85	67,000,000	136.49	8.16	.68	.0068
" 16	40,224,000	"	127.05	188,225	3.16	1,232	110	70	120	67,600,000	136.49	7.97	.68	.0068
" 23	41,388,000	"	131.61	194,985	3.17	1,236	100	150	70	67,200,000	136.49	8.35	.68	.0067
" 30	44,400,000	"	139.25	206,325	3.13	1,223	160	150	15	68,100,000	139.99	8.92	.68	.0065
June6	43,200,000	"	136.50	202,220	3.15	1,231	160		150	67,600,000	136.49	8.54	.68	.0065
" 13	48,396,000	"	153.14	226,875	3.16	1,233	54	118	110	67,500,000	136.49	8.73	.68	.0060
" 20	46,740,000	"	148.56	220,110	3.18	1,240	168	168		67,100,000	136.49	8.55	.64	.0060
" 27	49,116,000	"	151.46	224,390	3.08	1,202	168	40	128	69,200,000	148.74	8.93	.77	.0060

HAYS STATION.

DATE 1908	GALLONS PUMPED	Cost of Coal Per Ton	Total Cost of Fuel	Pounds of Coal	Cost of Fuel Per Million Gallons	Pounds of Coal used in Raising a Million Gallons 100 Feet	PUMPS AND HOURS IN USE				DUTY	Cost of Labor	Cost of Oil	Cost of P & W	Total Cost Per 1000 Gal
							L D G	L D G	L D G	Wash Pump					
July 4	49,824,000	1.35	153.84	227,915	3.09	1,204	50	131	155		69,100,000	148.74	9.12	.68	.0060
"11	47,688,000	"	153.94	228,063	3.22	1,257	168	160	-		66,200,000	146.99	8.74	.68	.0065
"18	52,800,000	"	167.21	247,725	3.16	1,234	100	92	144		67,400,000	148.74	9.20	.90	.0060
"25	46,184,000	"	143.44	212,625	3.10	1,211	130	153	46		68,800,000	141.74	8.54	-	.0060
Aug.1	45,224,000	"	145.25	215,180	3.21	1,253	22	160	130		66,500,000	139.99	8.73	.77	.0065
" 8	46,272,000	"	143.21	212,160	3.09	1,205	168	-	148		69,100,000	136.49	8.92	.68	.0060
"15	45,532,000	"	135.51	205,205	3.04	1,186	130	150	48		70,200,000	136.49	8.74	.68	.0060
"22	44,562,000	"	137.82	204,180	3.09	1,204	-	164	155		69,100,000	136.49	8.54	.68	.0060
"29	45,152,000	"	139.26	206,305	3.10	1,198	168	20	124		69,500,000	136.49	8.54	.68	.0063
Sep.5	46,776,000	"	143.58	212,715	3.06	1,196	168	148	-		69,600,000	136.49	9.11	.77	.0062
" 12	46,060,000	"	145.85	216,070	3.09	1,207	50	168	110		69,000,000	136.49	8.93	.68	.006
" 19	46,673,000	"	143.55	212,660	3.07	1,199	144	105	80		69,500,000	136.49	9.11	.68	.0062
" 26	49,128,000	"	150.62	223,135	3.06	1,196	20	168	130	4	69,700,000	136.49	9.22	.68	.006
Oct.3	45,792,000	"	142.67	211,360	3.11	1,211	140	160	18		68,600,000	136.49	8.92	.68	.006
" 10	44,604,000	"	138.52	205,210	3.10	1,134	168	-	130		75,700,000	136.49	8.73	.68	.0064
" 17	43,152,000	"	133.41	197,650	3.08	1,111	160	120	20		76,100,000	136.49	8.55	.68	.0065
" 24	41,218,000	"	130.68	193,595	3.17	1,146	44	153	115		74,100,000	136.49	8.36	.68	.0067
" 31	43,602,000	"	138.68	205,445	3.18	1,149	96	68	155		73,900,000	142.74	8.55	.68	.0067
Nov.7	42,980,000	"	136.78	202,640	3.18	1,149	168	-	144		73,900,000	147.29	8.64	.68	.0081
" 14	43,200,000	"	140.69	208,435	3.25	1,176	160	150	2		72,200,000	138,74	8.91	.68	.0067
" 21	43,932,000	"	140.35	207,925	3.19	1,155	96	155	65		73,500,000	142.39	8.92	4.68	.0068
" 28	41,124,000	"	133.09	197,170	3.23	1,170	-	160	150		72,600,000	148.64	8.72	.68	.0071
Dec.5	41,104,000	"	133.63	197,970	3.25	1,174	148	20	155		72,300,000	148.74	8.54	1.88	.0071
" 12	40,006,000	"	130.55	193,410	3.26	1,179	15	145	160		72,000,000	148.74	8.35	.68	.0072
" 19	38,458,000	"	126.89	187,990	3.29	1,190	168	130	-		71,300,000	160.99	8.16	1.88	.0077
" 26	39,404,000	"	127.17	188,405	3.22	1,166	168	132	-		72,800,000	162.69	8.16	.68	.0076

Following are tabulated the filter operation, as to coagulant and cost. The high average in the last quarter of 1908 is due to the discoloration of the waters of the Monongahela by laurel and a strenuous attempt to decolorize with lime:

		Lime		Alum		Iron		Soda Ash	
Quarter	Gal.Filtered	Lbs.	Gr. per Gal	Lbs.	Gr. per Gal	Lbs.	Gr. per Gal	Lbs.	Gr. per Gal.
4/27/7	631,293,600	37725	.42	66050	.73			29370	.32
7/27/7	626,940,400	9050	.10	69200	.77				
10/26/7	655,974,200	35840	.36	57130	.61	1650	.02	705	.01
1/25/8	615,122,300	26960	.30	54265	.61				
4/25/8	619,996,300	9054	.12	59080	.66				
7/25/8	592,518,400	69595	.81	31620	.37	22110	.25	10510	.12
10/24/8	592,279,000	98640	1.13	45775	.54	8160	.09	11160	.13
1/30/9	576,372,000	206420	2.50	46075	.55			41420	.50

- COST -

Quarter	Lime	Alum	Iron	SodaAsh	Ex.Lab.	Com.Lab.	Repairs	Total	perMil.
4/27/7	131.78	558.66		266.79	465.00	50.78		1473.01	2.33
7/27/7	31.83	584.86			435.00	121.14		1172.83	1.87
10/26/7	125.31	557.43	8.25	6.34	473.25	215.30	21.63	1407.51	2.14
1/25/8	94.11	506.22			375.00	199.20	63.96	1238.49	2.01
4/25/8	36.11	550.81			375.00	242.86	290.75	1495.53	2.41
7/25/8	240.03	294.99	18.98	93.60	375.00	175.87	101.49	1299.96	2.19
10/24/8	340.65	425.21	73.44	100.40	390.00	137.37	138.95	1606.02	2.71
1/30/9	816.22	429.11		377.32	400.00	212.95	86.72	2322.32	4.03

Following are tabulated the bacterial results obtained:

Weekly results given below are average of one count daily.

Week ending	Bacteria per C.C. Raw	Bacteria per C.C. Filtered	B.Coli Raw	B.Coli Filtered
Feb.9th, 07	80	1	Neg.	Neg.
16th,	10	1	"	"
23rd,	13	0	"	"
Mar.2nd,	26	1	Pos.	"
9th,	85	1	"	"
16th,	174	2	"	"
23rd,	72	1	"	"
30th,	32	0	Neg.	"
Apr.6th,	4	0	"	"
13th,	3	0	"	"
20th,	21	1	Pos.	"
27th,	64	2	"	"
May 4th,	33	0	Neg.	"
11th,	38	0	"	"
18th,	61	1	"	"
25th,	24	0	"	"
Junelst,	7	0	"	"
8th,	175	1	Pos.	"
15th,	192	2	"	"
22nd,	111	0	Neg.	"
29th,	37	2	"	"
July6th,	31	1	"	"
13th,	281	3	Pos.	"
20th,	284	14	Neg.	"
27th,	388	16	Pos.	"
Aug.3rd,	440	1	Neg.	"
10th,	70	0	"	"
17th,	64	4	Pos.	"
24th,	13	2	"	"
31st,	78	4	"	"
Sept7th,	7	2	Neg.	"
14th,	109	25	"	"
21st,	5348	382	"	"
28th,	3	0	"	"
Oct.5th,	82	1	"	"

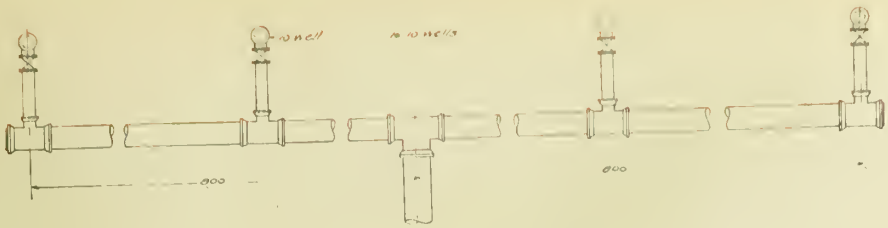
Week ending	Bacteria per C.C. Raw	Filtered	B.Coli Raw	Filtered
Oct. 12th,07	607	55	Neg.	Neg.
19th,	104	37	"	"
26th,	47	8	"	"
Nov. 2nd,	255	11	"	"
9th,	203	46	Pos.	"
16th,	120	11	"	"
23rd,	10	1	Neg.	"
30th,	30	0	"	"
Dec. 7th,	22	0	"	"
14th,	41	0	"	"
21st,	213	6	"	"
28th,	29	5	"	"
Jan. 4th,08	42	0	"	"
11th,	8	0	"	"
18th,	785	50	Pos.	"
25th,	23	0	Neg.	"
Feb. 1st,	50	2	Pos.	"
8th,	11	0	Neg.	"
15th,	407	0	"	"
22nd,	27	0	"	"
29th,	13	0	"	"
Mar. 7th,	65	5	"	"
14th,	40	0	"	"
21st,	105	0	"	"
28th,	20	0	"	"
Apr. 4th,	6	0	"	"
11th,	37	0	"	"
18th,	62	0	"	"
25th,	144	0	"	"
May 2nd,	70	0	"	"
9th,	541	0	"	"
16th,	193	0	"	"
23rd,	41	0	"	"
30th,	29	0	"	"
June 6th,	15	0	"	"
13th,	14	0	"	"
20th,	18	0	"	"
27th,	16	0	"	"
July 4th,	14	0	"	"
11th,	14	0	"	"
18th,	15	0	"	"
25th,	12	0	"	"
Aug. 1st,	56	0	Pos.	"
8th,	248	1	Neg.	"
15th,	161	1	"	"
22nd,	93	0	"	"
29th,	52	0	"	"
Sept. 5th,	16	0	"	"

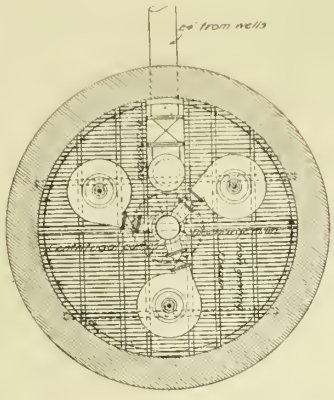
Week ending	Bacteria per C.C.		B.Coli	
	Raw	Filtered	Raw	Filtered
Sept.12th,08	10	0	Neg.	Neg.
19th,	46	0	"	"
26th,	11	0	"	"
Oct. 3rd,	40	0	"	"
10th,	7	0	"	"
17th,	3	0	"	"
24th,	14	0	"	"
31st,	19	0	"	"
Nov. 7th,	67	0	"	"
14th,	35	0	"	"
21st,	8	0	"	"
28th,	9	0	"	"
Dec. 5th,	20	0	"	"
12th,	8	0	"	"
19th,	5	0	"	"
26th,	13	0	"	"
Jan. 2nd,	10	0	"	"
9th,	12	0	"	"
16th,	23	3	"	"
23rd,	95	6	"	"
30th,	68	0	"	"

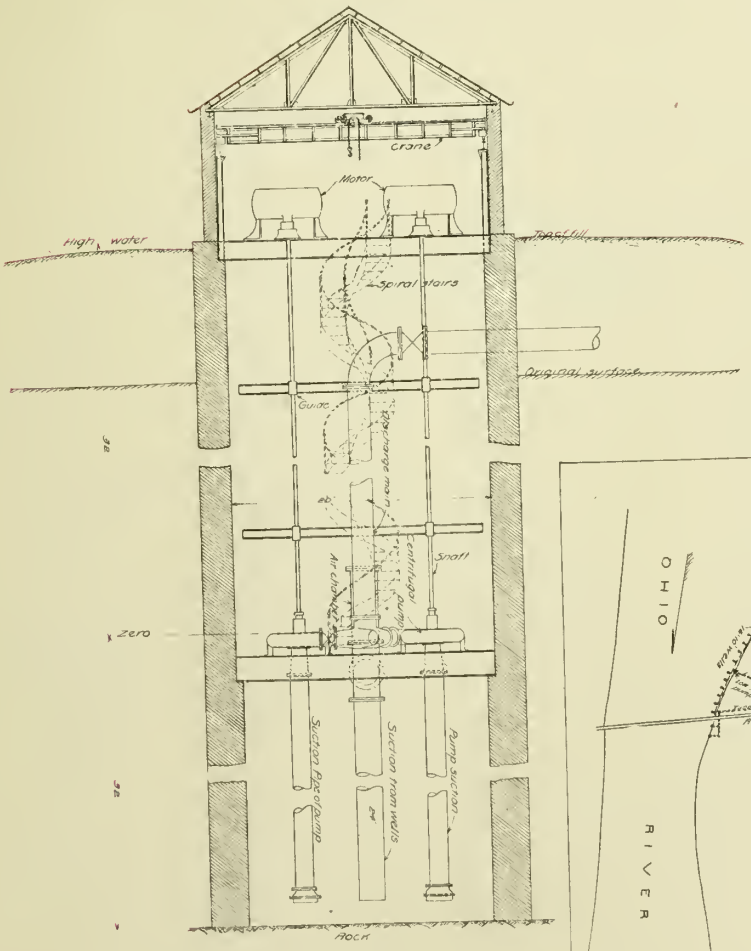
In addition to the general plan, the features of this plant original to the designer are the settling basins, i.e. the method of introducing and taking out the water and the plan of the bottoms to facilitate cleaning.

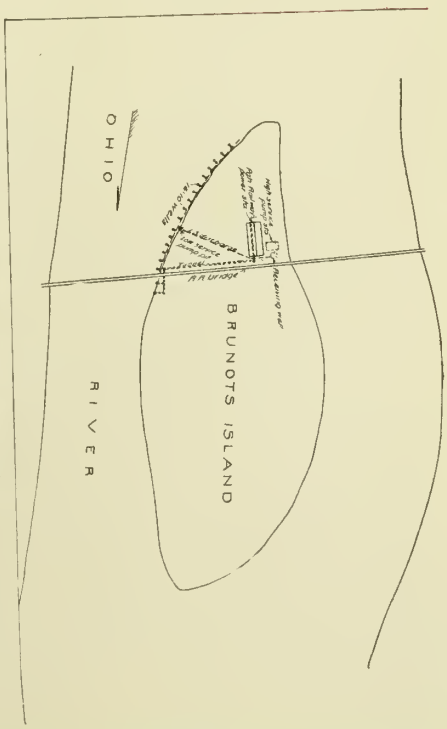
The filter strainers, not shown in detail, are of our own design. In the gravity concrete work a new type of expansion joint was tried and proved successful. The method of handling coal and ashes is also original. But in general, the credit we claim is collecting from every source available the best and most modern ideas and so assembling them as to create a plant that for its first cost has produced an efficiency and may be and is operated at an economy that challenges; it has now been in operation over two and a half years and neither its designer nor owner has, to this date, found cause to be other than proud of it.

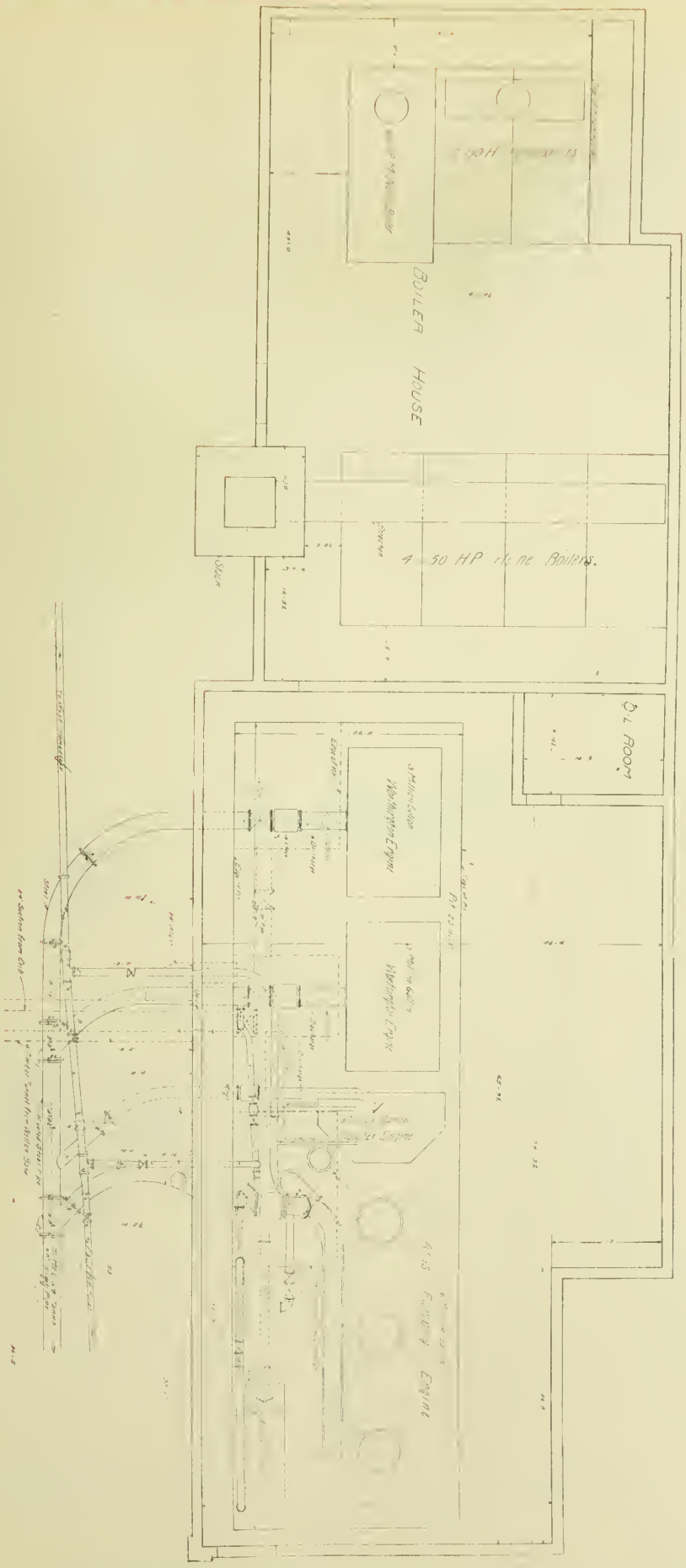
John M. Chesler.
B.S. C.E. '91.

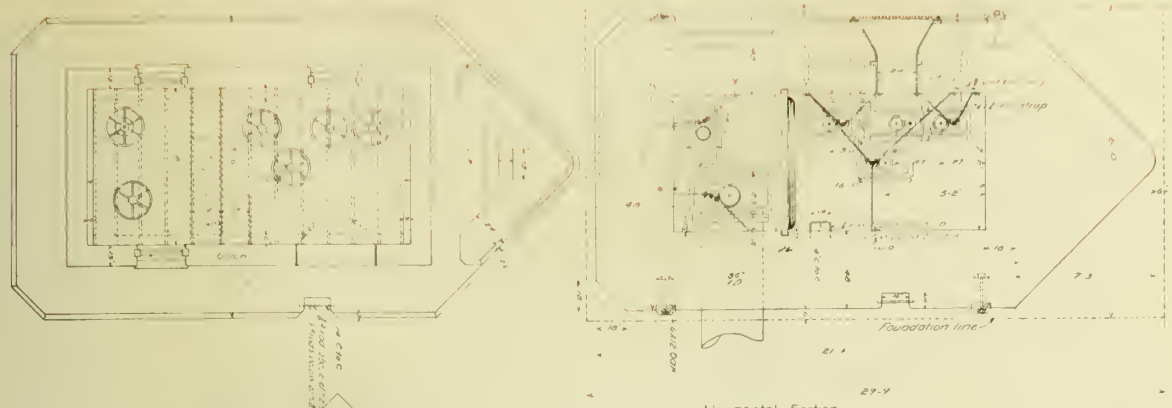

900
600

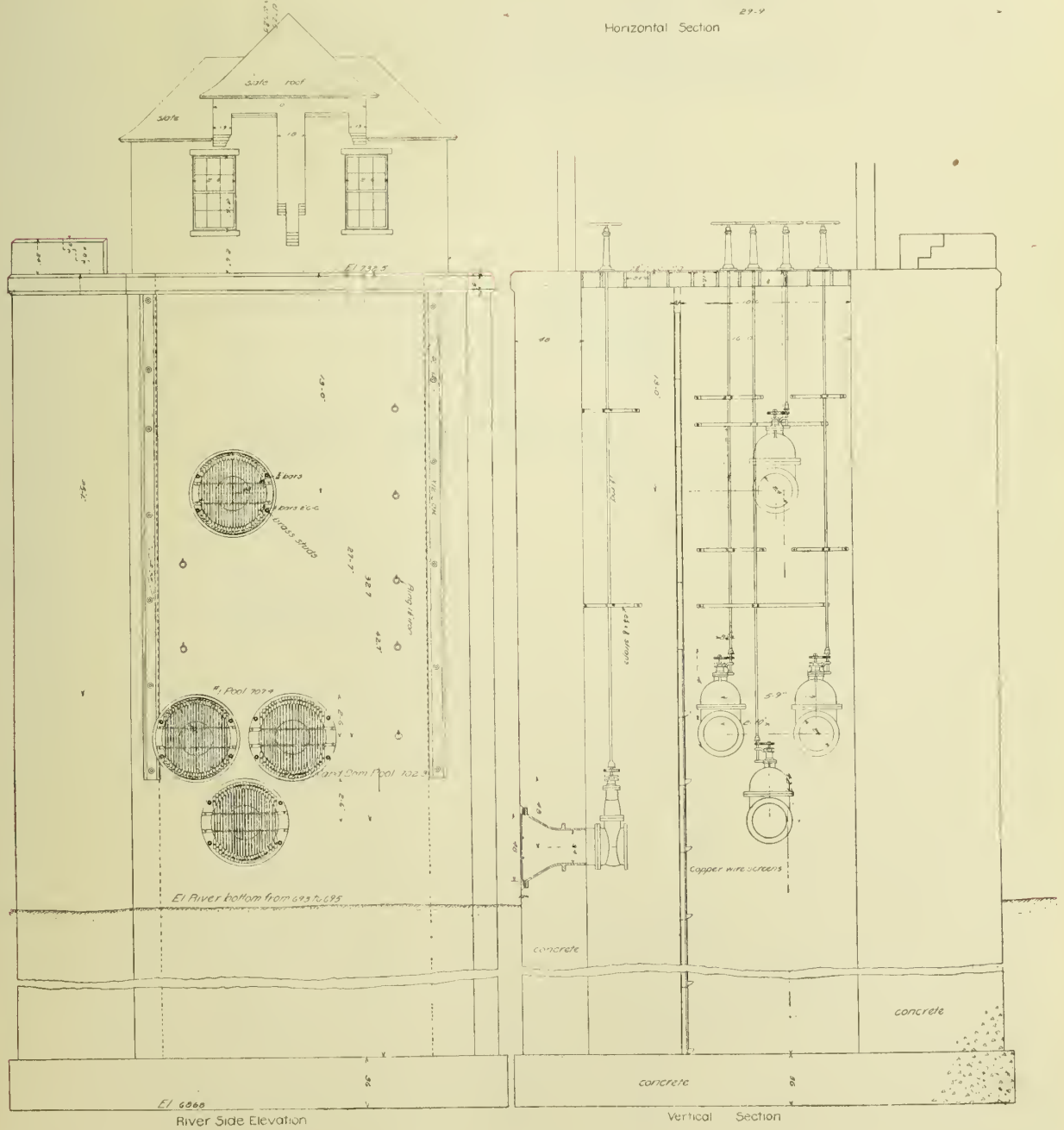

24' from wells

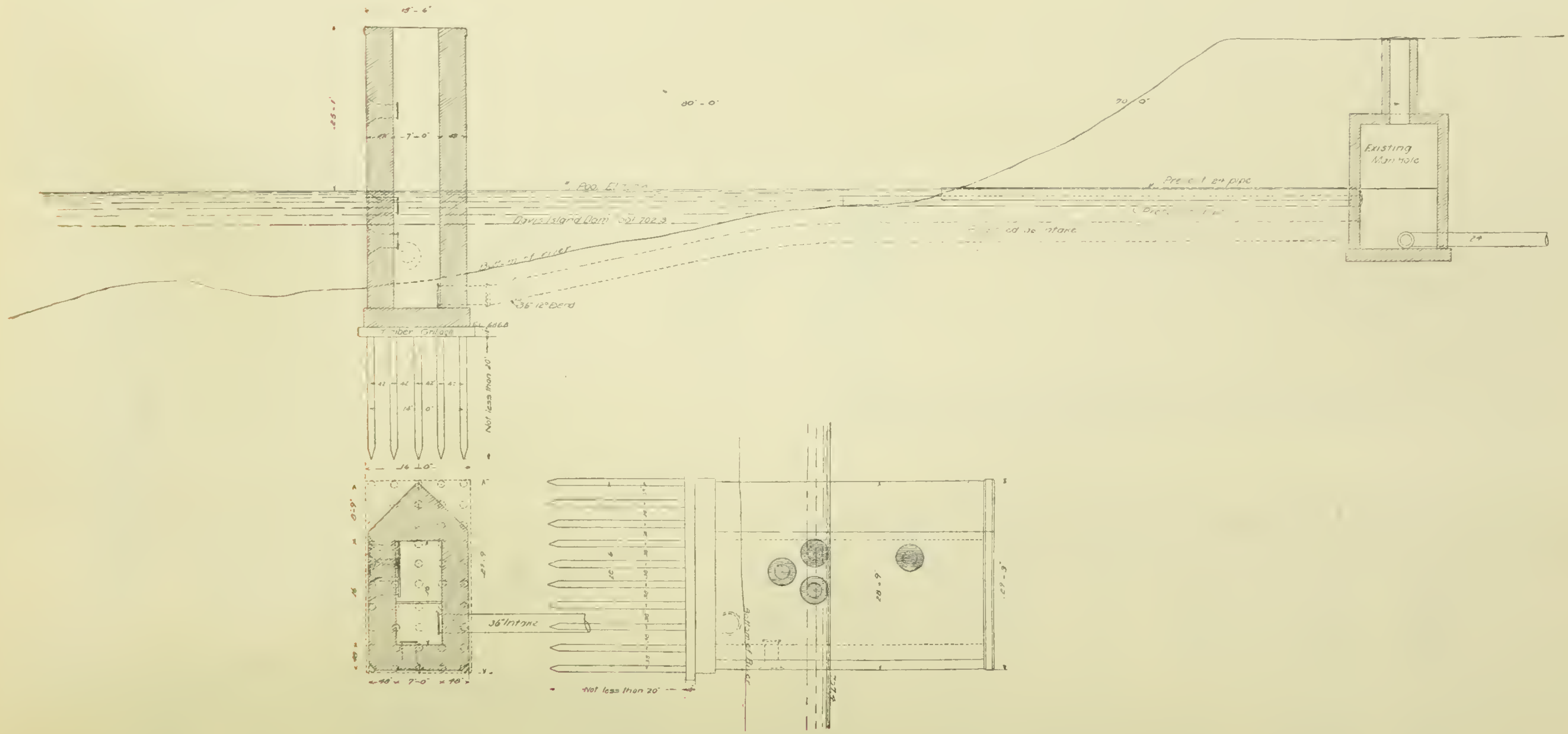

Crane
Motor
High water
Spiral stairs
Guide
Shaft
Zero
Suction from wells
Pump suction
Rock


OHIO
BRUNOTS ISLAND
RIVER

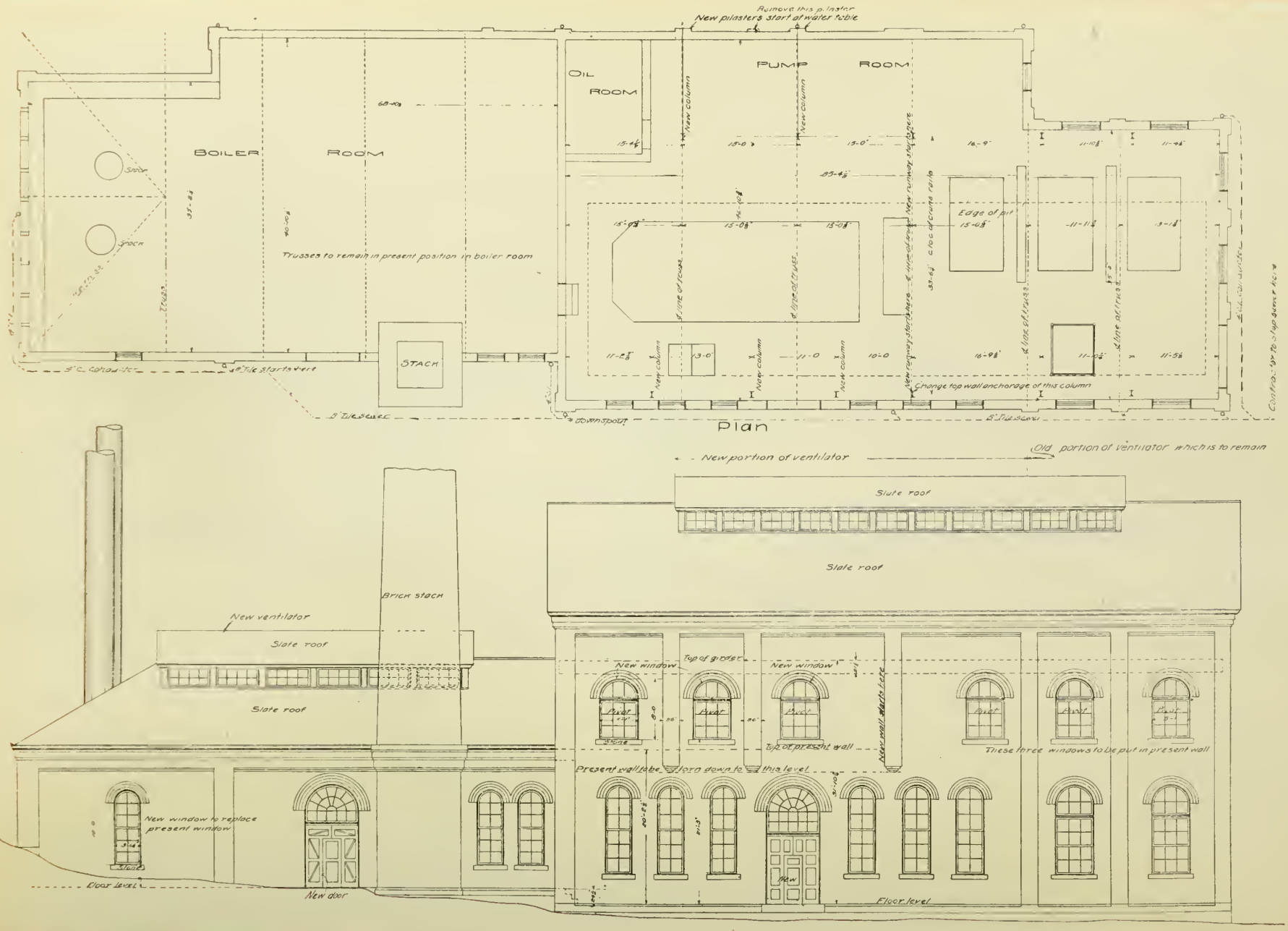

BOILER HOUSE
4 - 50 HP Horizontal Boilers.
COAL ROOM


Foundation line
Horizontal Section

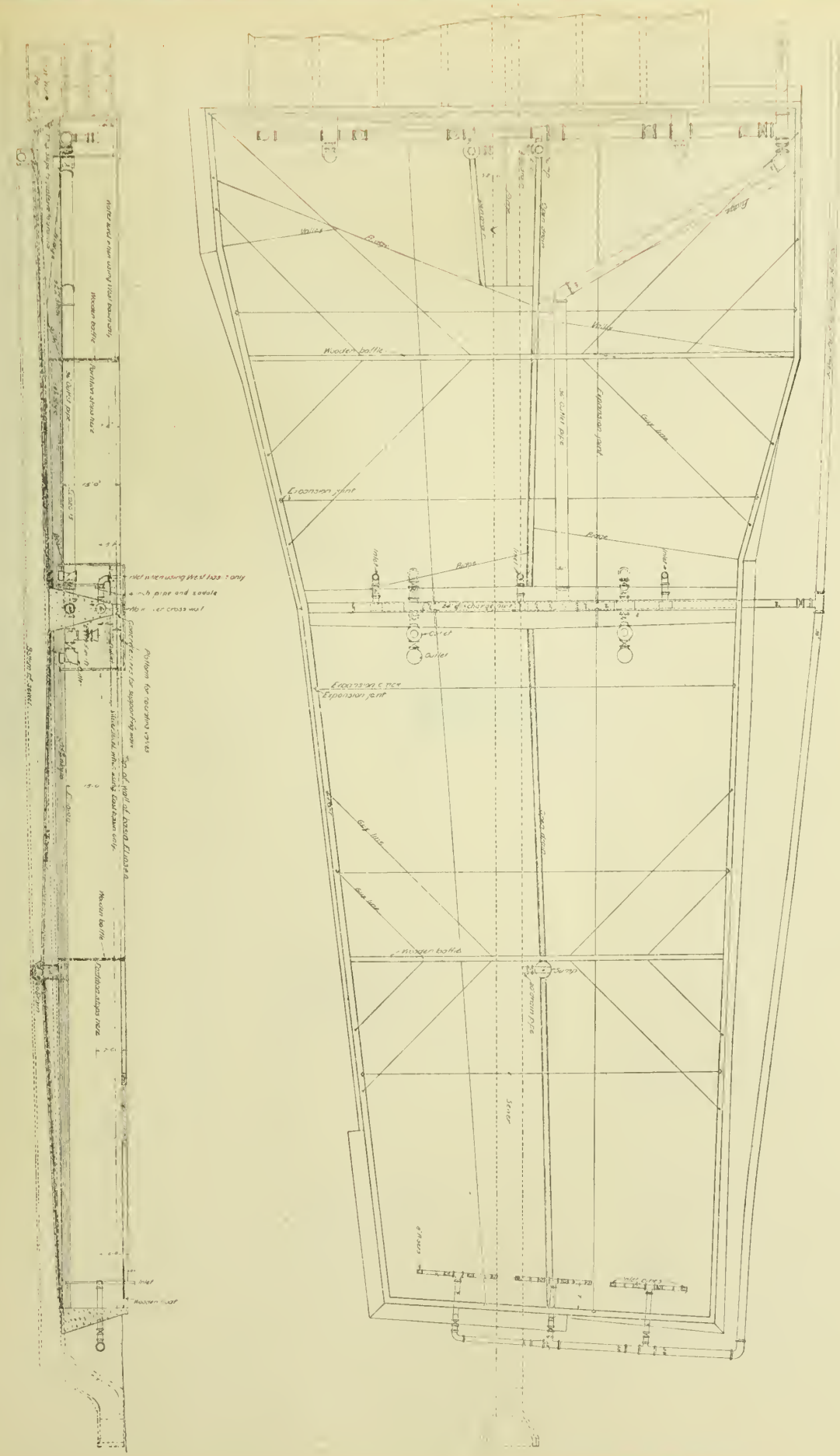

Slate roof
El 732.5
Copper wire screens
concrete
concrete
concrete
El River bottom from 693 to 695
El 686
River Side Elevation
Vertical Section

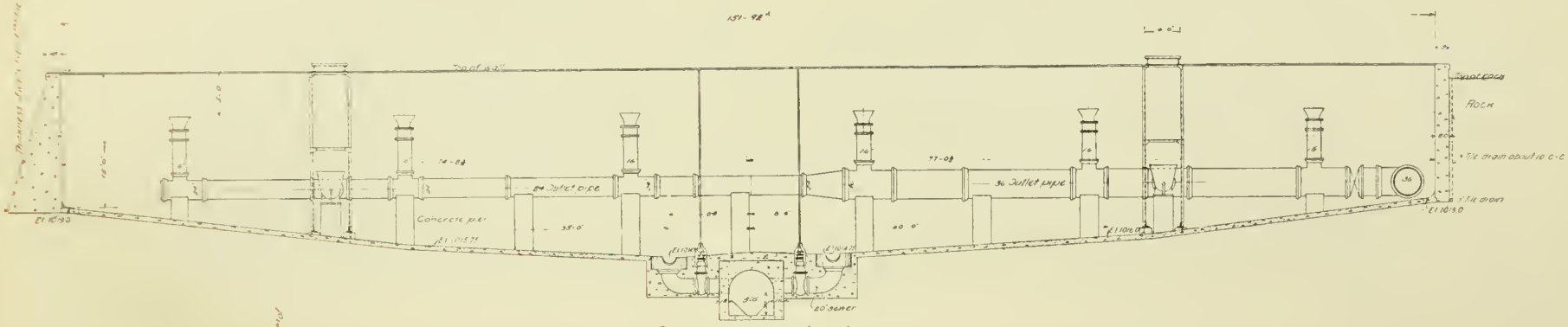


80'-0"
70'-0"
Existing Manhole
Davis Island Dam
36" 12" Bend
Timber Grillage
Not less than 20'
36" Intake
Not less than 20'

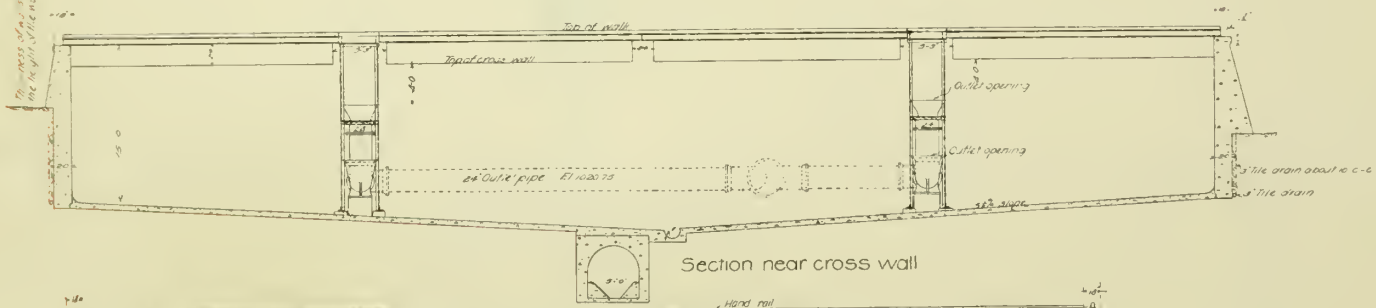

Remove this plaster
New pilasters start at water table
BOILER ROOM
OIL ROOM
PUMP ROOM
Trusses to remain in present position in boiler room
STACH
Edge of pit
Change top wall anchorage of this column
Plan
New portion of ventilator
Old portion of ventilator which is to remain
Slate roof
Brick stach
New ventilator
New window
Top of girder
Top of present wall
These three windows to be put in present wall
Present wall to be storn down to this level
New window to replace present window
Door level
New door
Floor level


Boiler House
Pump House
Sump
Settling Basin
Coal Unloading House
PUBLIC ROAD
MIDDLE STREET

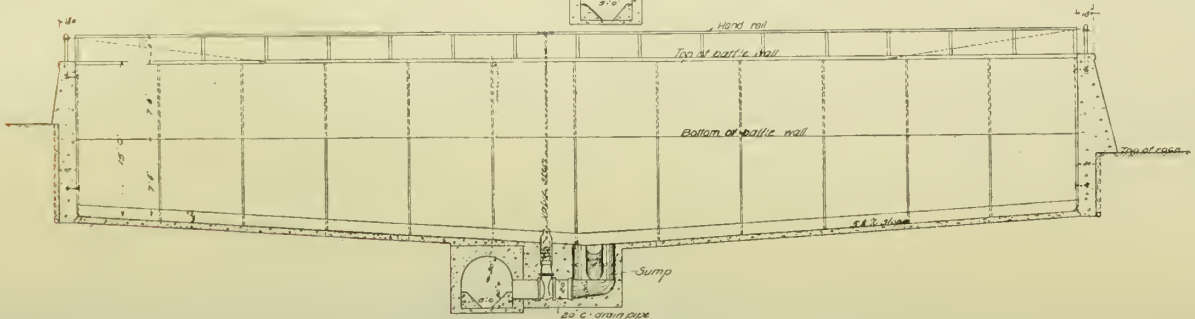

Wooden baffle
Expansion joint
Expansion joint
Expansion joint
Expansion joint
Wooden baffle
Scum



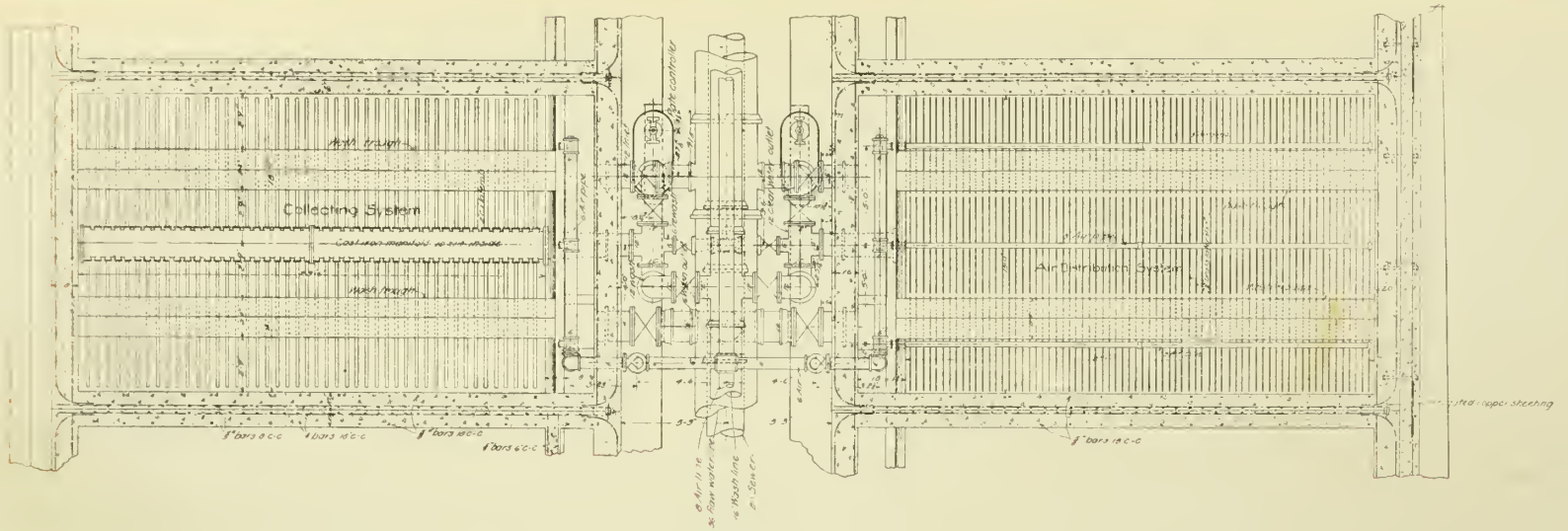
Section near west end



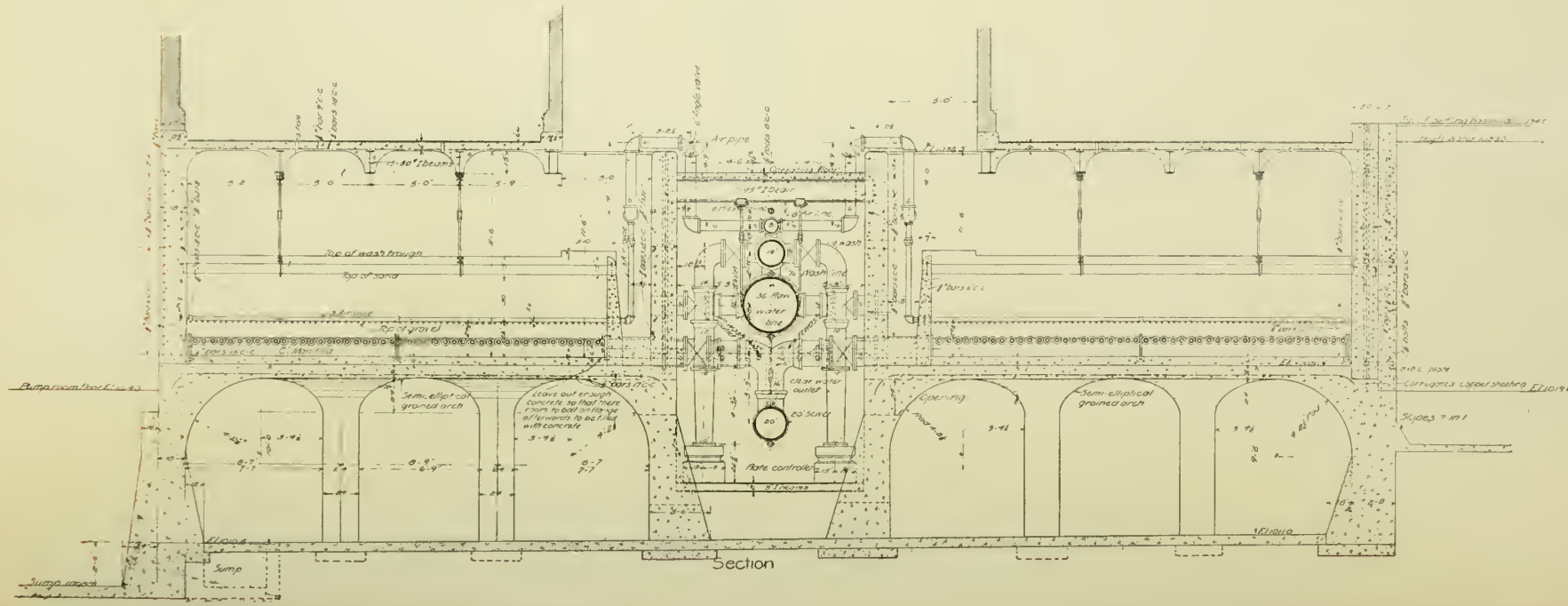
Section near cross wall



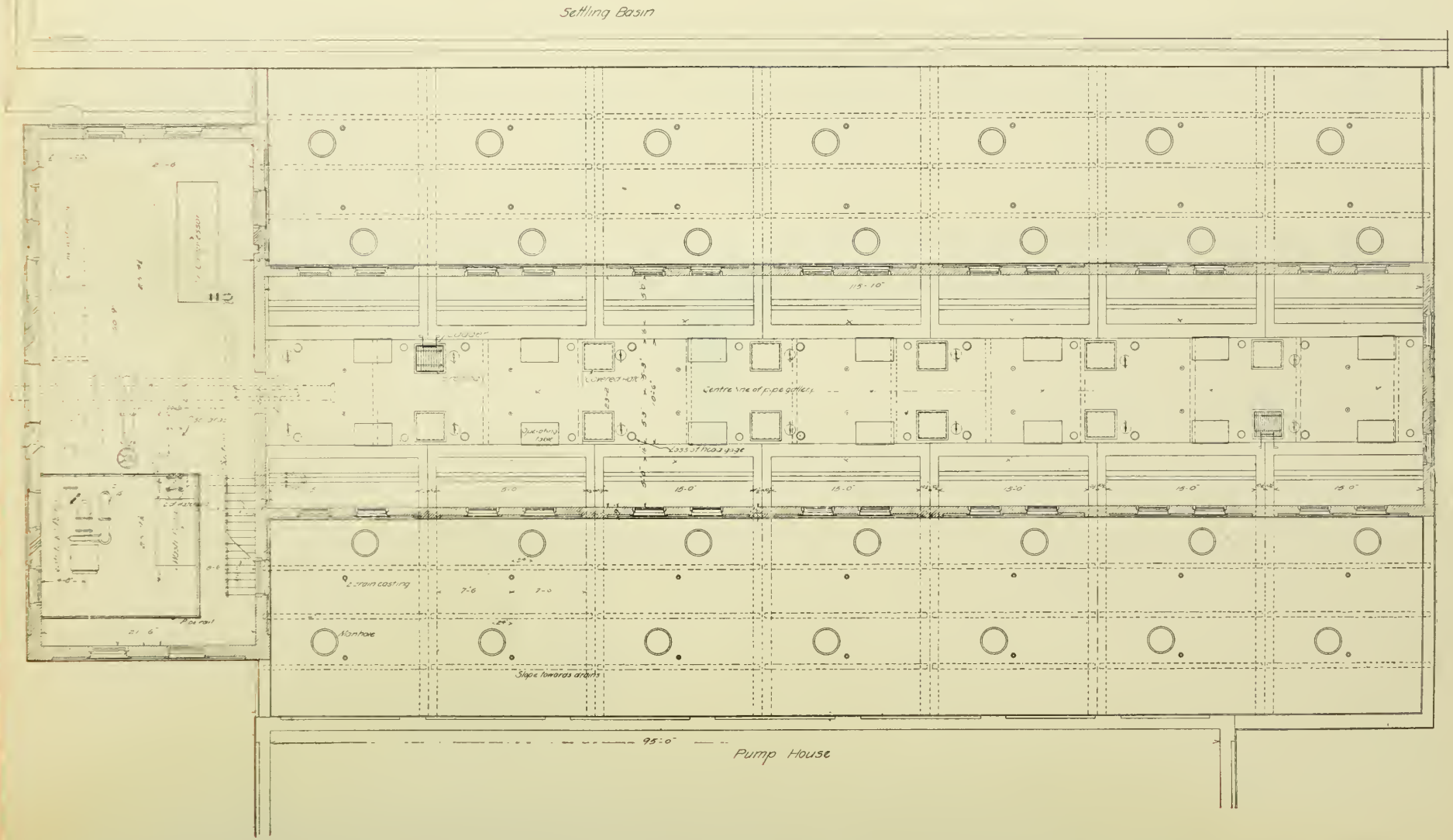
Cross Section through upper sump

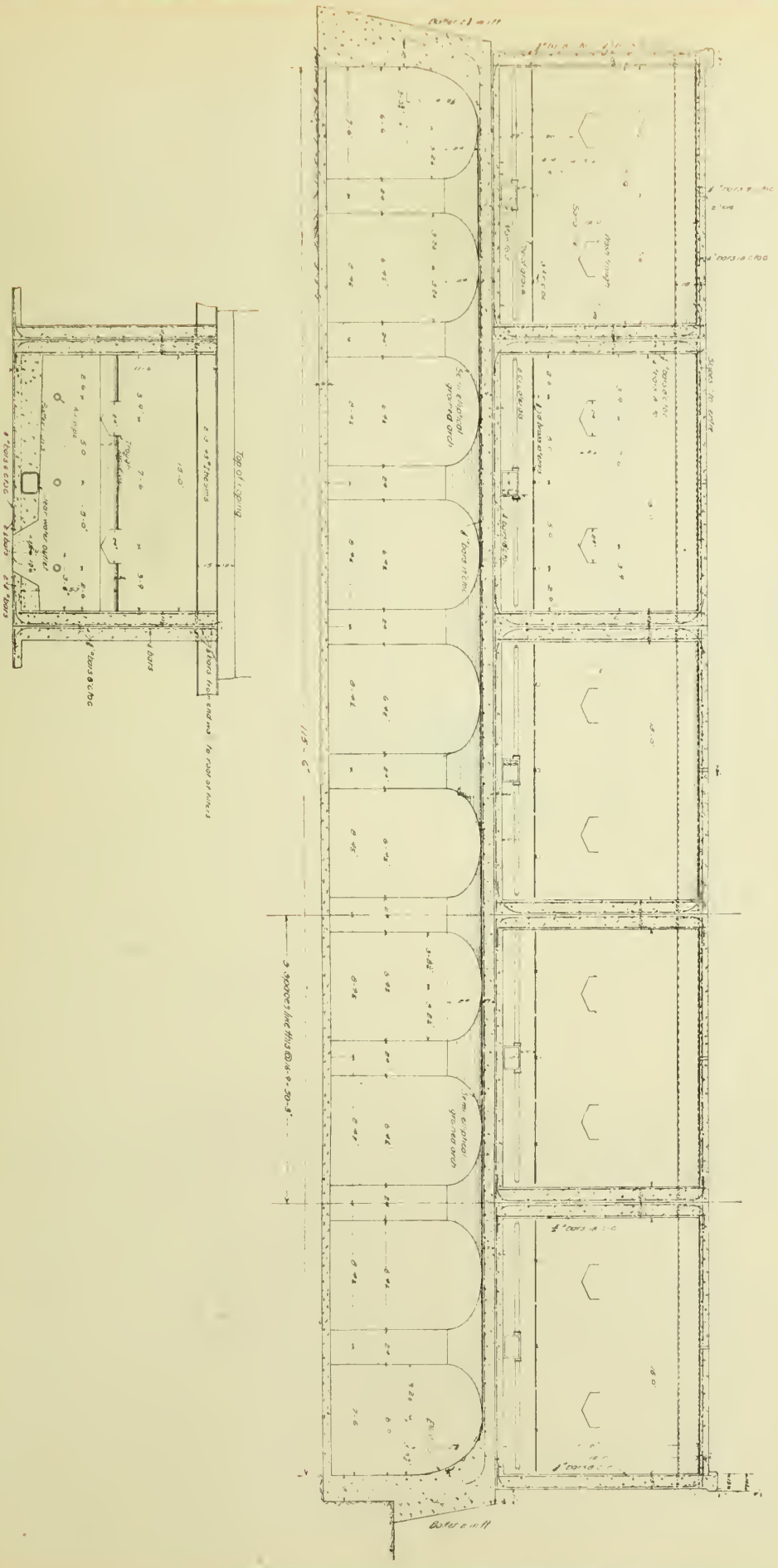


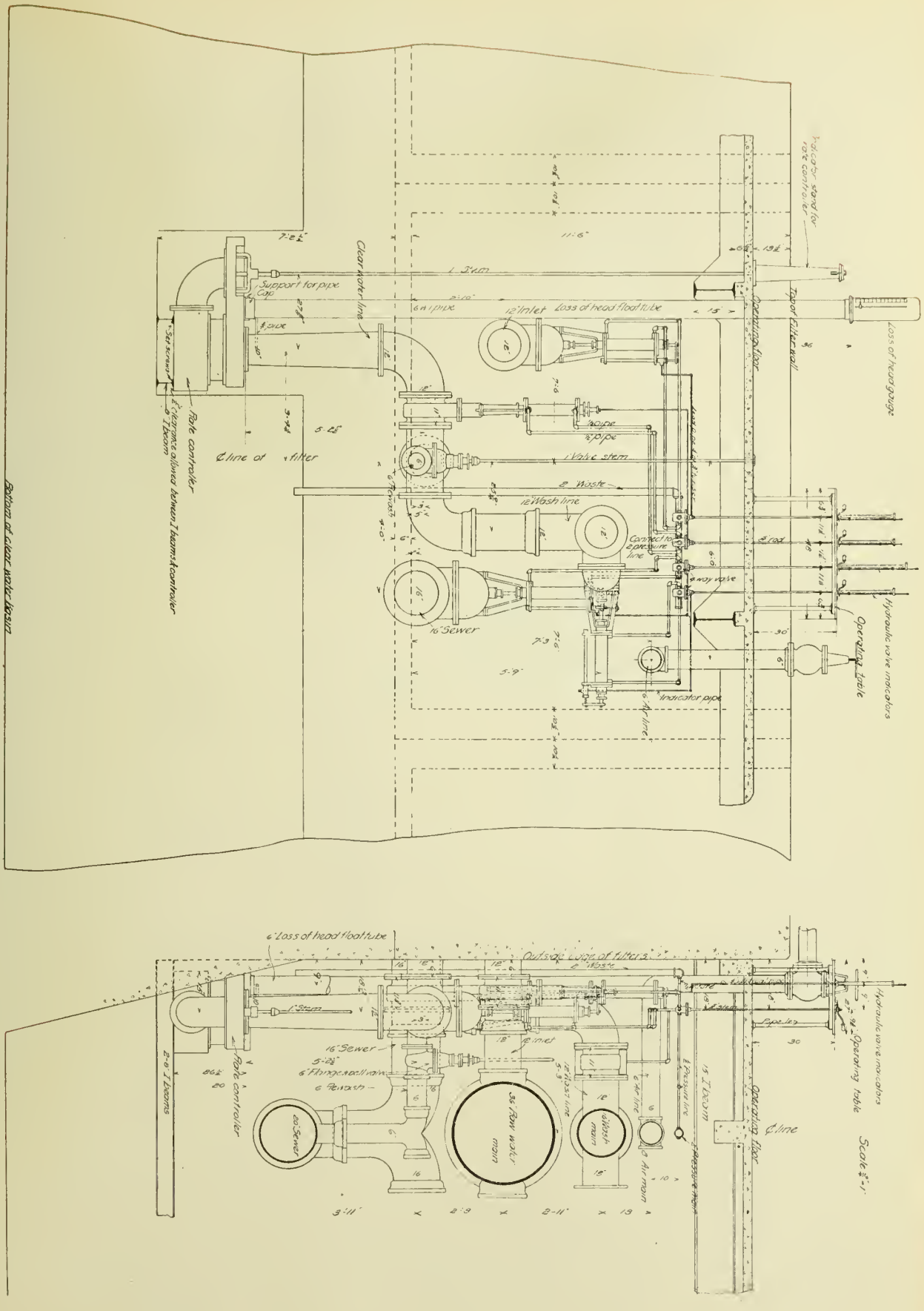
Sectional Plan



Section

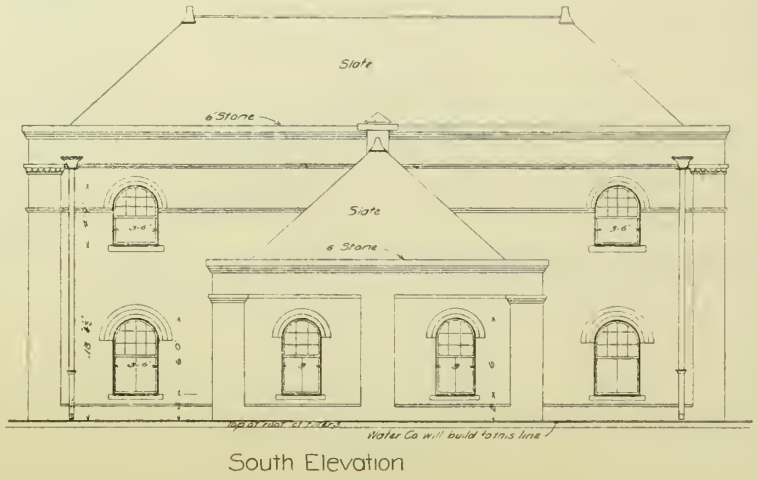

Settling Basin
115'-10"
Centre line of pipe gallery
Loss of head gauge
15'-0"
2 iron castings
Manhole
Slope towards drains
95'-0"
Pump House




Indicator stand for rate controller
Clear water line
Support for pipe
Cap
6" I pipe
12" Inlet
Loss of head float tube
Operating floor
Top of filter wall
Loss of head gauge
Set screws
Rate controller
℄ line of filter
12" Wash line
Connect to compressed air line
4 way valve
Hydraulic valve indicators
Operating table
16" Sewer
Indicator pipe
Air line
Bottom of clear water basin
6" Loss of head float tube
Outside edge of filter
2" Waste
Hydraulic valve indicators
Operating table
Scale
16" Sewer
6" Air line
Air main
℄ line

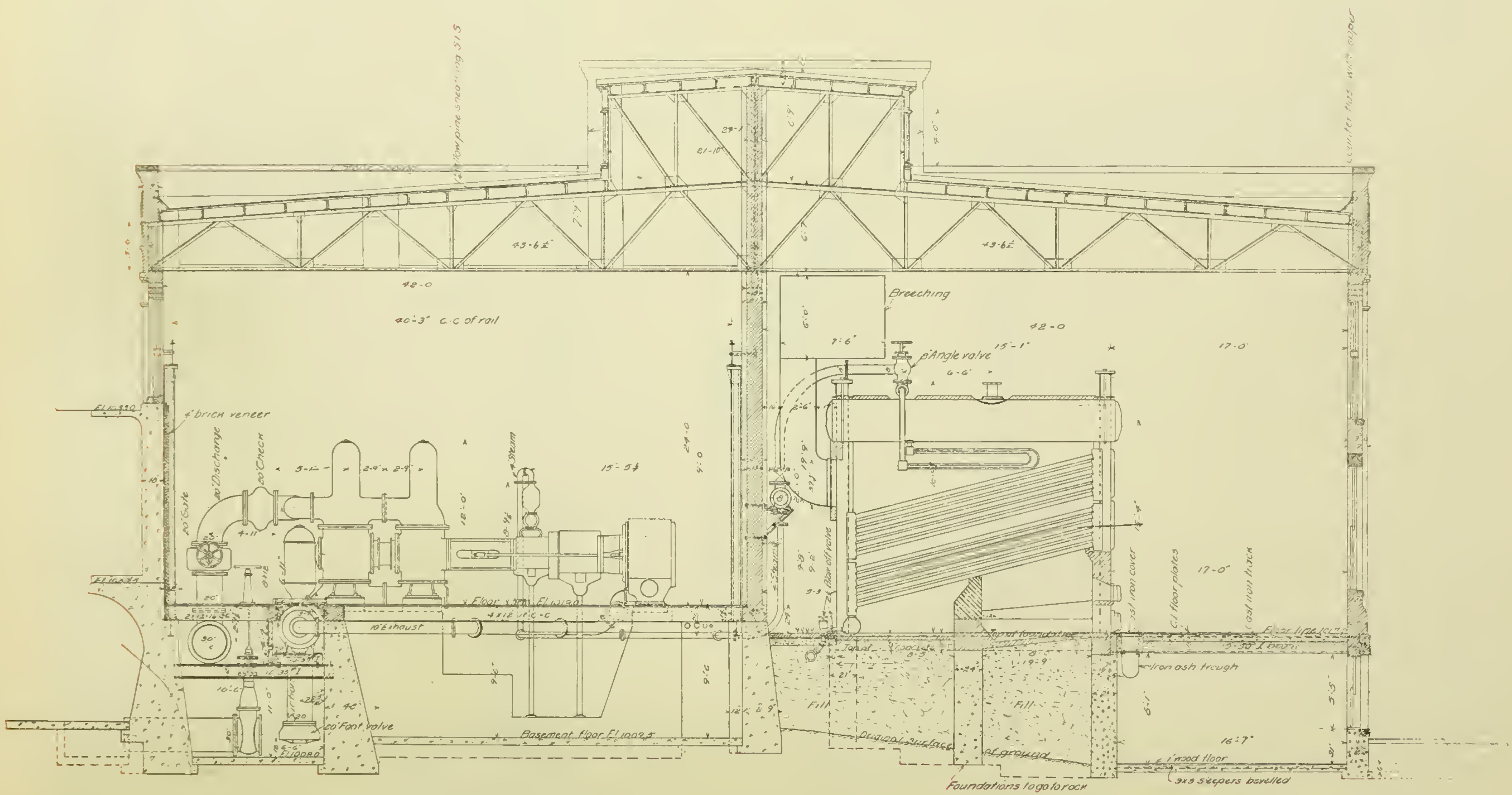
West Elevation
East Elevation the same

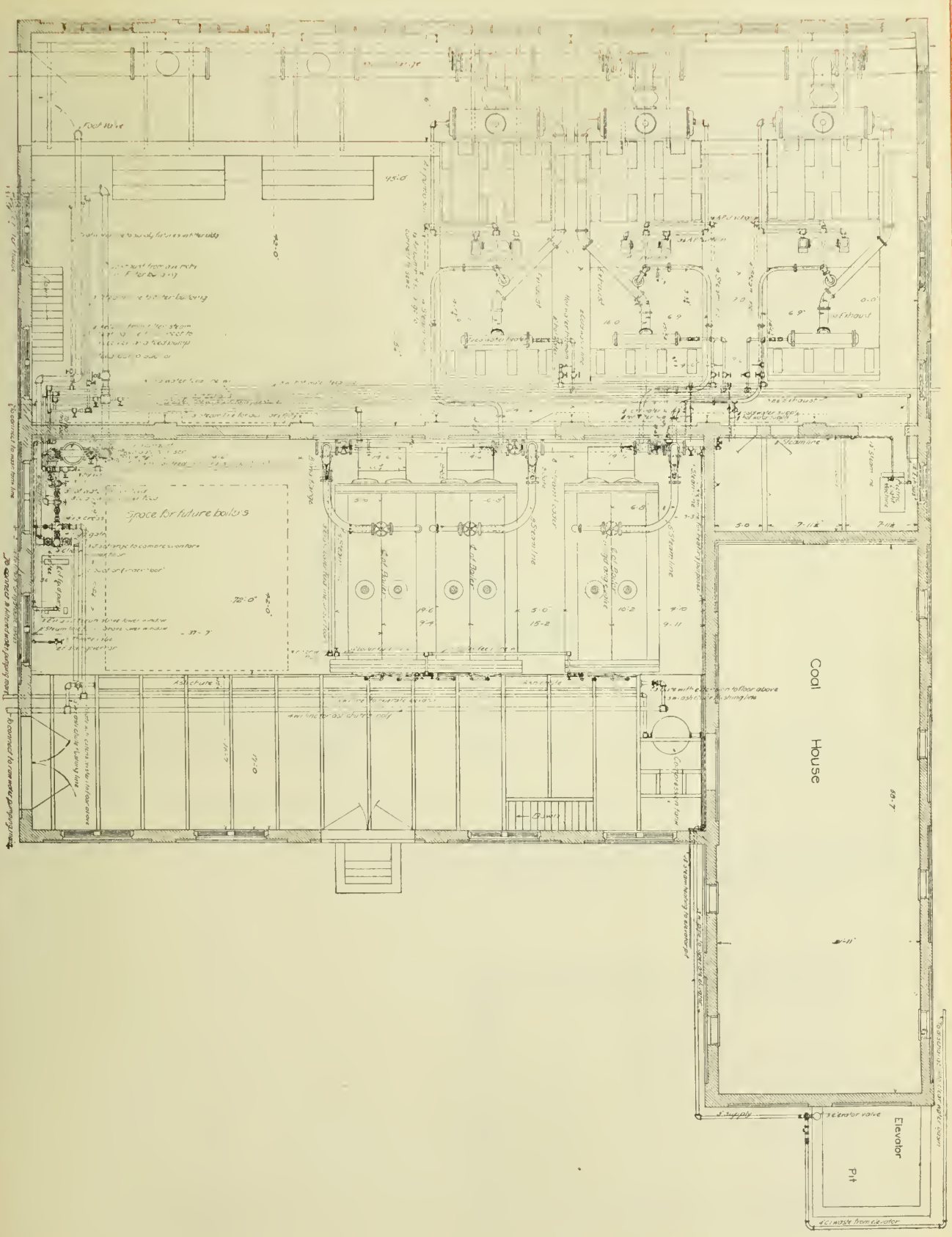
North Elevation

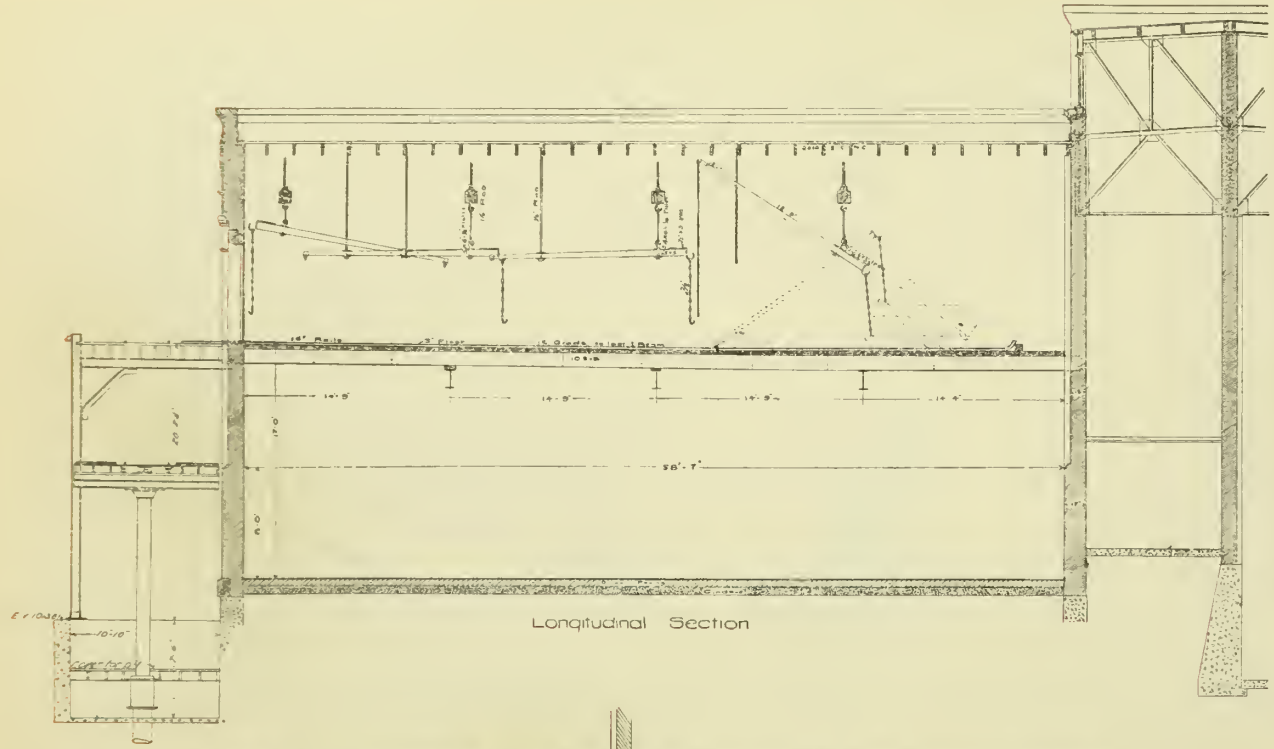


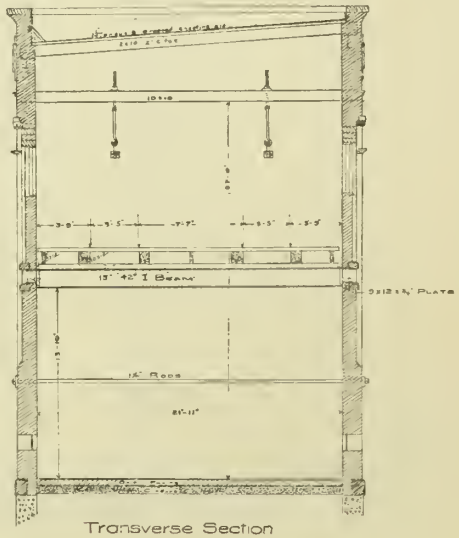
South Elevation

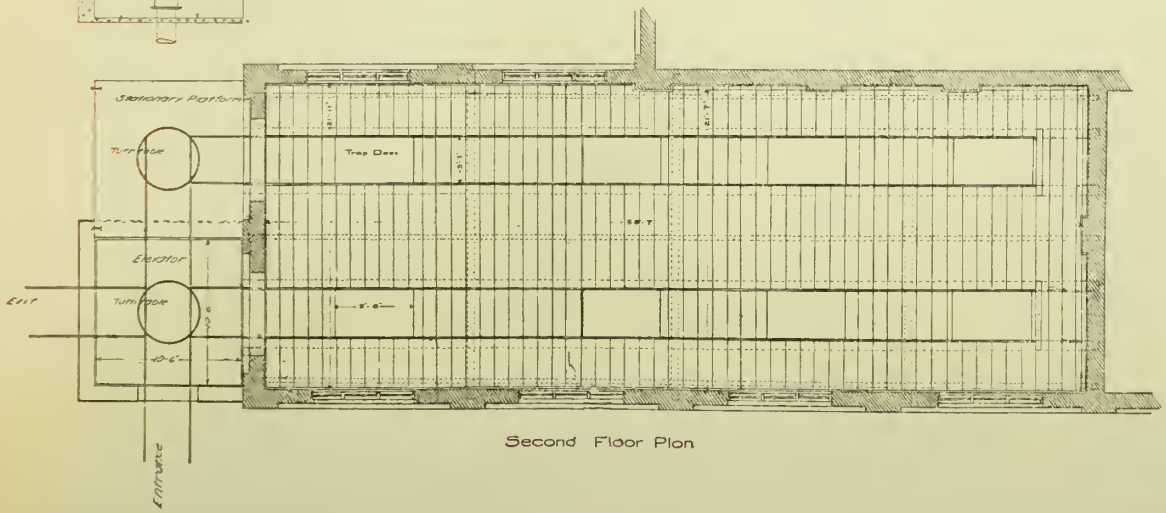
N

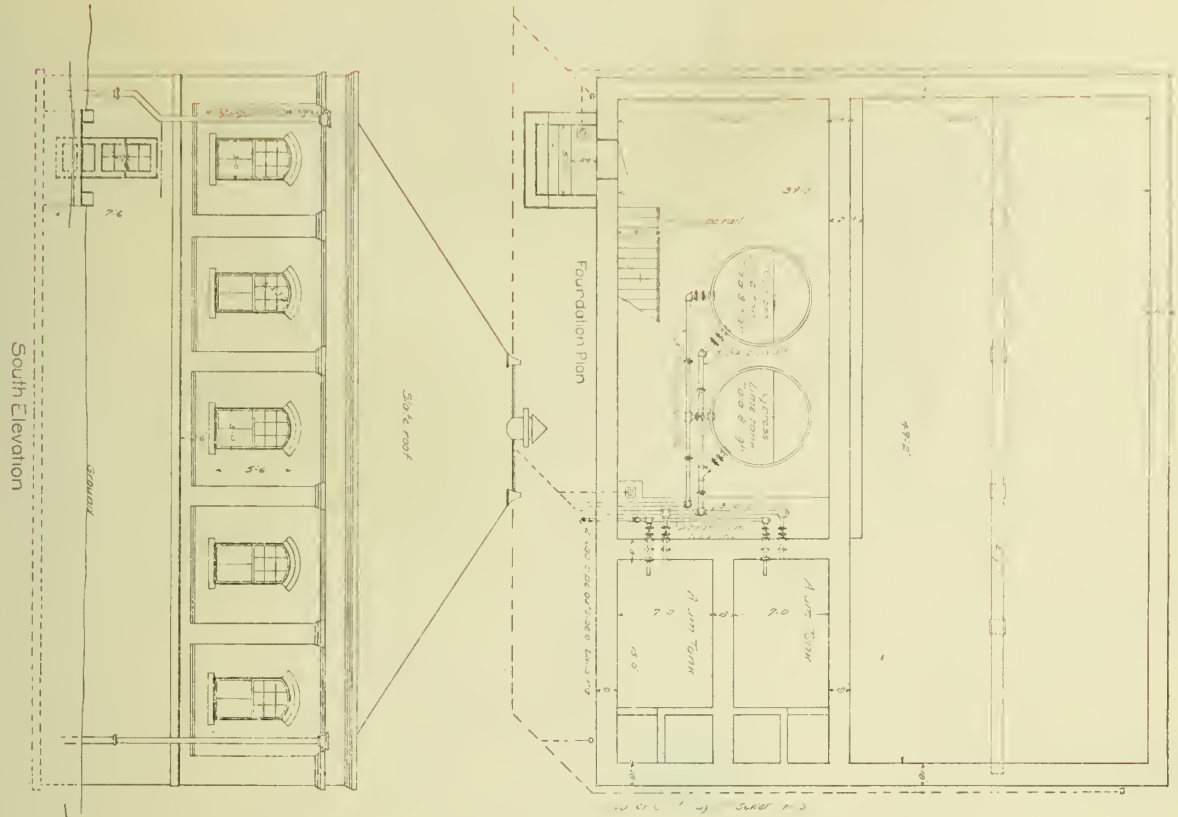

Yellow pine sheathing S1S
Breeching
Angle valve
40'-3" c.c of rail
4" brick veneer
20" Gate
20" Discharge
20" Check
Steam
Floor
10" Exhaust
Blow off valve
C.I. floor plates
Cast iron track
Iron ash trough
Fill
Original surface of ground
Foundations to go to rock
wood floor
3x8 sleepers bevelled
20" Foot valve
Basement floor El. 1002.5

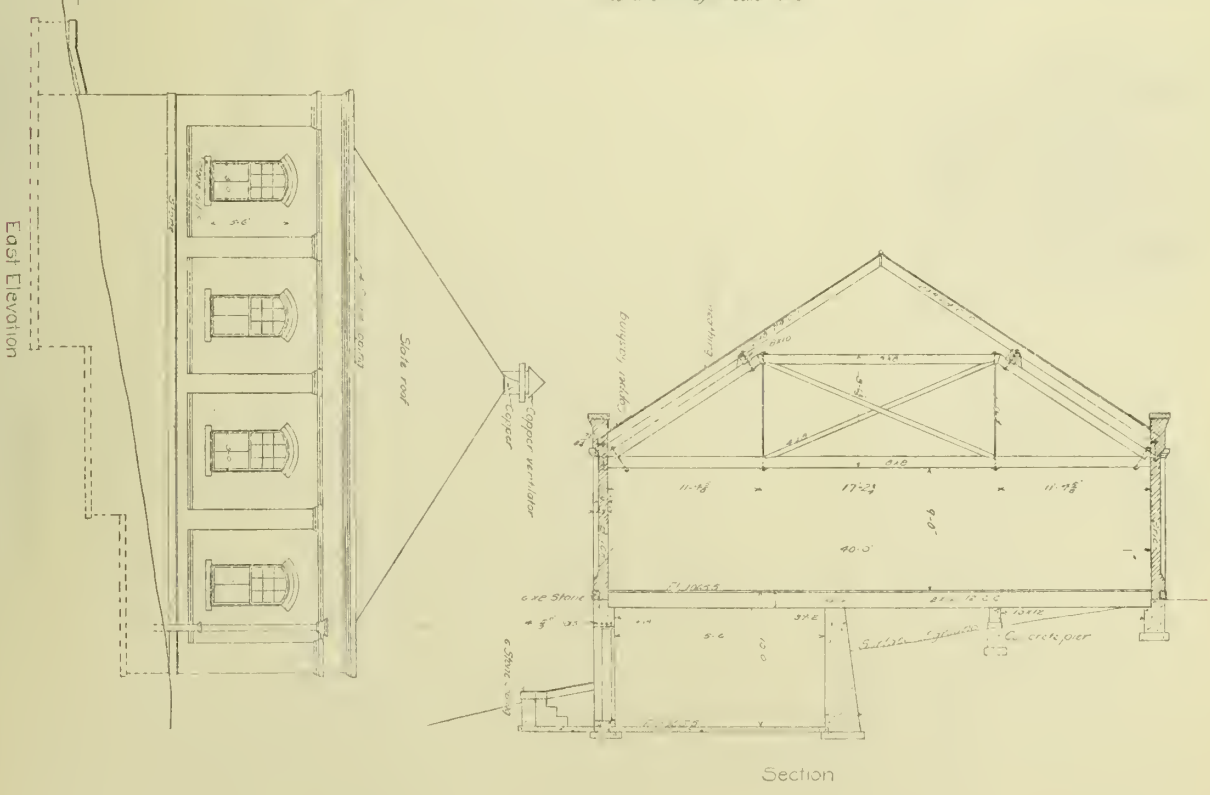

Space for future boilers
Coal House
Elevator Pit

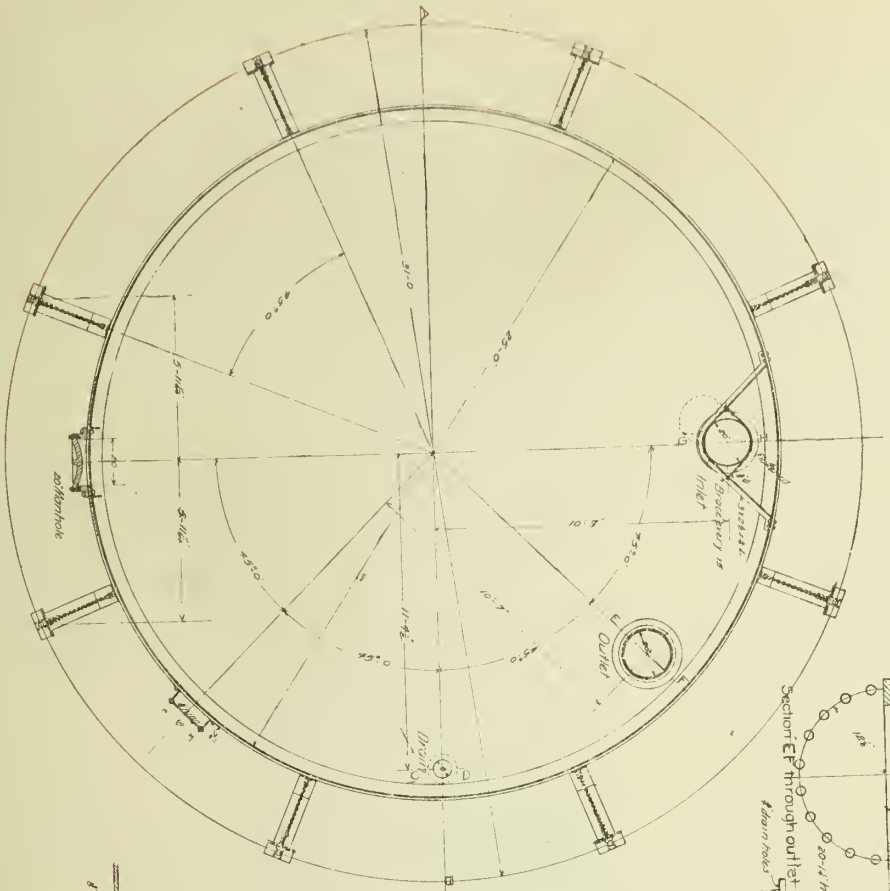

Longitudinal Section

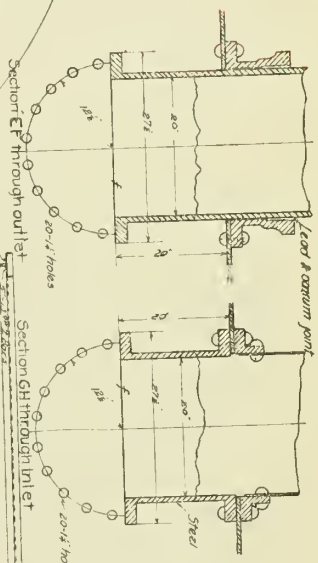

Transverse Section

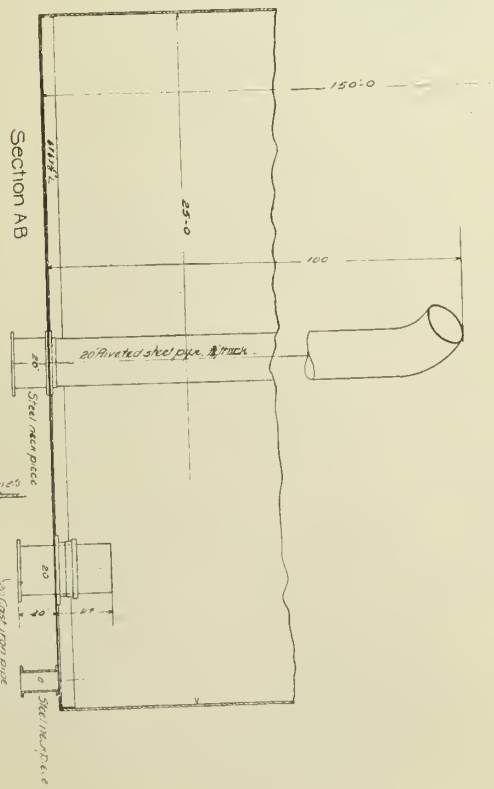

Second Floor Plan

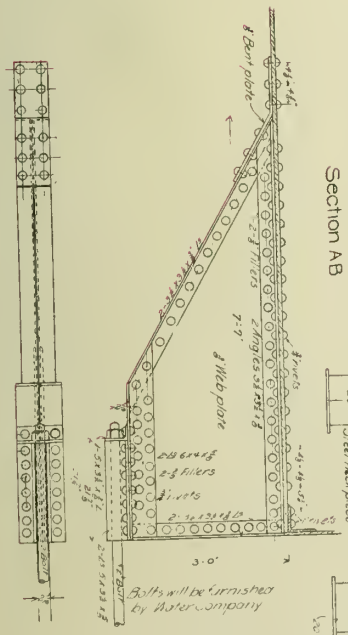

South Elevation
Foundation Plan


East Elevation
Section



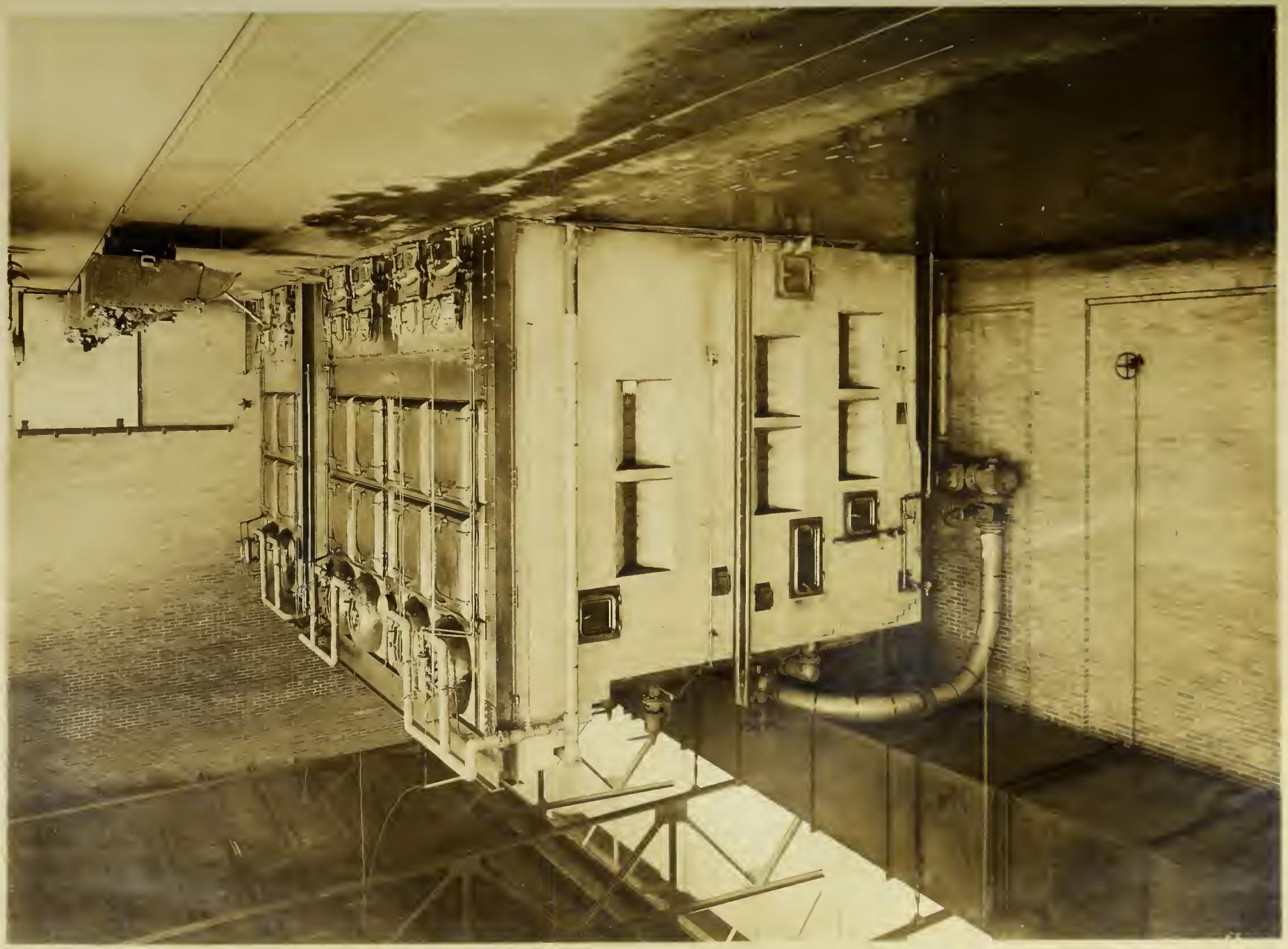






Detail of Anchor Lugs

12
11



APPENDICES

ESTIMATE FOR IMPROVEMENTS FOR THE SOUTH PITTSBURG WATER COMPANY WITH SITE FOR FILTER PLANT AT HAYES STATION

Machinery, 1st lift, 140 lbs. Head		
Making #2 H.R.W.Pump a triple and repairing surface condenser,	7,000.00	
Putting larger water end on #1 H.R.W.	8,000.00	15,000.00
Machinery, 2nd lift, 169 lbs. Head		
3 low duty 5,000,000 gal. triples at $20,000.00 each,	60,000.00	
Pipe work for connecting same,	10,000.00	70,000.00
Boilers at new station,		13,500.00
Pump Station Complete		
Boiler and Engine House with Sump,	22,000.00	
Stack and foundation,	6,000.00	
Crane and Runway,	3,000.00	
Coal and alum track,	700.00	31,700.00
Settling basin including all pipe connections, valves, baffle walls, etc.		62,000.00
Filters, Clear Water Basin and Superstructure, Complete		
Filters, building and clear water basin,	70,000.00	
Wash tank and connections,	6,000.00	
Alum house, elevator, alum and lime tanks,	8,000.00	84,000.00
Mains and Reinforcing Lines		
7900' - 24" pipe from junction to filter plant,	40,000.00	
2700' - 24" pipe from filter plant to Brownsville Road,	13,500.00	
7800' - 20" pipe from Agnew Avenue to Penn Avenue parallelling 8" line,	26,500.00	
Forward	$ 80,000.00	$276,200.00

Brought Forward	$80,000.00	$276,200.00
2600' - 10" pipe from Junction to connect to 8" Homestead line at Becks Run Sta.	3,500.00	
9600' - 8" pipe from end of 12" at Stewarts Lane to Whitehall tanks,	7,600.00	
6000' - 8" pipe on Elizabeth Road from Whitehall tanks to connect with 12" line at B.& O.R.R.	5,100.00	96,200.00
Tanks		
1 Tank 25' in dia. and 150' high,		16,000.00
Alterations and Additions to Becks Run Station		
Alterations to present building,	8,000.00	
New Coal House,	5,000.00	13,000.00
New intake and tunnel at Becks Run Station,		25,000.00
Changing roads, sewer, tunnel and grading at new station,		8,000.00
Property and Rights of Way,		20,000.00
AUXILIARY MACHINERY		
Blower for filters,	2,000.00	
Electric Light Plant,	2,000.00	
Wash Pump,	3,500.00	
Feed Pumps,	600.00	
Heater,	400.00	8,500.00
Laboratory Fittings and Supplies,		1,500.00
Total		$464,400.00
10% for supervision and contingencies,		46,400.00
Grand Total,		$510,800.00

ESTIMATE ON UNDERGROUND WATER SUPPLY ON BRUNOTS ISLAND

16 - 10" wells 30' deep,	8,000.00
Piping wells to wet well,	12,500.00
Wet well, pit, superstructure and crane,	12,000.00
Grading grounds and improvements,	2,500.00
2 - 3,000,000 gal. centrifugal motors, with wiring,	10,500.00
11,000'- 24" force main from low service to high service pump house,	5,500.00
High service pump house with basement and crane,	15,000.00
Receiving basin 500,000 gallons,	10,000.00
2 - 3,000,000 gallon pumps high service (Low duty triples)	24,000.00
	$100,000.00

The above includes nothing for Engineering, Superintendency or Contingencies.

BIDS RECEIVED ON FURNISHING A NEW FIVE MILLION WATER END FOR THE HIGH DUTY PUMP AT BECKS RUN, AND TWO NEW HIGH PRESSURE STEAM CYLINDERS FOR THE LOW DUTY ENGINE:

R.D.Wood & Co.	(For High Duty Water End complete (Accumulator and Air Tank (All pipe work to connect accumulator (" " " " " exhaust, (Air Compressor,	8250.00
	(For low duty, (H.P.Steam Cylinders 14 x 36 (Intermediate Exhausts	3010.00
	(2 Reheaters,	150.00
H.R.Worthington	(For High Duty Water End complete (Accumulator (Condenser (For low duty, (H.P.Steam Cylinders,	9000.00
Epping-Carpenter	(For High Duty Water End complete (Condenser and Air Pump (Accumulator,	7500.00
	(For low duty, (Steam Cylinders,	1500.00
	(Reheaters,	900.00

This contract was placed with Epping-Carpenter Company.

S P E C I F I C A T I O N S

FOR MASONRY INTAKE PIER AND CAST IRON INTAKE FOR SOUTH PITTSBURG WATER COMPANY

It is the intent of the following specifications to describe the furnishing of all material (with exceptions noted) and performing all labor of building an intake pier according to plans accompanying these specifications.

A permit will have been obtained from the Secretary of War and arrangement for the occupation of the space in the river necessary to do the work has been made with the Monongahela River Coal & Coke Company, and a right of way will be obtained from the P.& L.E. Railroad, but notwithstanding the above, the work must be done under the supervision of the U.S.Government Engineer for this district, and plans for false work, cofferdam, etc. must be submitted to him for approval prior to beginning the work.

Consideration must also be had for the fact that the Coal Company occupy the river adjacent as a boat yard, and prior to beginning the tunnel under the P.& L.E. tracks, arrangement must be made with said Railroad that will insure the safety of traffic over the above work.

MATERIAL

The South Pittsburg Water Company will furnish at the Becks Run Pumping Station the four cast iron inlets with screens, all gate valves, the 30" cast iron pipe, the extension stems for the gate valves, and the stands and wheel handles to be placed at the top, (but not the strap iron brackets that must be attached to the wall for the guiding of the extension valve stems); also all cross screens and blanks making up the cross partition shown on plans 10 feet from one end of the inner space, and it must be distinctly understood that all material other than mentioned above must be furnished by the contractor.

SUB-FOUNDATION

Borings made by the Water Company would indicate a gravelly clay strata at the depth shown, but if when the excavation has been completed to this depth, the sub-foundation available is in the opinion of the engineers of the Water Company not firm enough,

the contractor may be required to excavate 5 feet additional depth, or if test borings reveal that an insufficient foundation will be available at the extra 5 foot depth, then the contractor will be required to drive piling over the entire area as per the clause in these specifications headed "Piling", the contractor being expected to name the additional amounts for the extra 5 feet and also for driving the piling.

SUB-STRUCTURE

The sub-structure, except where otherwise indicated by plans, will be built of concrete, and all other material, appliances, and parts shown, must be furnished except as noted above, and put in place by the contractor.

Care must be taken to form the grooves intended for the reception of the cross screens in a perpendicular position. They must be even, and the measurements from depth to depth of groove on each side must not vary more than 1/4" throughout the entire structure.

The ladders shown on the outside must begin at Davis Island Dam pool level, and continue to the top of the sub-structure. The ladder on the inside must extend from bottom to top of the sub-structure.

The rings shown must be placed on each side of the sub-structure.

CONCRETE

All concrete is to be mixed on the ground under the supervision of an inspector provided by the Water Company, and will be composed of one part Portland cement of an approved brand, two parts of clean, sharp river sand, and four parts of broken stone or clean, well washed river gravel, all of which shall pass through a 2" ring.

It must be placed in layers and tamped to the satisfaction of the inspector furnished by the Water Company. The forms up to within one foot of No. 1 Pool Level may be rough, and no particular pains need be taken to secure a uniform surface so long as the cross section, as shown by the plans, is in no way cramped, but from one foot below No. 1 Pool Level to the top of the sub-structure the forms must be of dressed lumber, with dressed surface on the inside, and care must be taken to secure a uniform, presentable surface, which must have the cement mortar flushed to the edge and any irregularities revealed on removal of form must be corrected by troweling. Care must be taken to place all other

parts and appurtenances in their proper position as the work of placing the concrete progresses, and the substructure must be finished and permitted to set before the superstructure is begun.

30" INTAKE

The pipe and valve for this, as above stated, will be furnished by the Water Company, but must be placed by the contractor. The valve must be a double flanged gate valve, 12 feet in length; the remainder will be ordinary bell and spigot 30" ordinary weight cast iron pipe. The contractor will furnish the necessary yarn and lead and all tools necessary to the laying of this pipe. In laying this pipe all joints must be shoved home, must be evenly divided, and must be firmly yarned to a depth that will leave 2" of lead space. The lead for pouring the joints must be hot enough to scorch a pine stick before it is used for pouring, and all joints must be made at a single pouring. Sufficient room around the joints must be provided for the caulkers to work with ease that a first class job in every respect may be obtained, but in the conduct of this work care must be taken so as not to interfere with the present water supply nor endanger traffic on the P. & L.E. Railroad.

Entrance to the existing manhole may be made on a Sunday when the water supply to South Pittsburg can be kept up from other sources for a period of 8 hours, but after the pipe is entered, the opening made for same must be bricked or concreted in, in a first class manner, and in a way that will not impair the strength of this structure.

PILING

Should it be necessary to drive piling as a sub-foundation for this structure, the same must be provided on the ground of a length that will drive not less than 20 feet. They must be cut from live oak wood, they must not be less than 8" at the smallest end, and they must be reasonably straight and free from projecting knots or other deformities that would prevent their being driven close enough together to afford a suitable sub-foundation for the proposed structure. They must be driven in such a manner that they will not be shattered or broomed at the elevation at which they should be cut off to form the sub-foundation.

SUPERSTRUCTURE

The superstructure must be built as per plans. The brick must be of a good building quality laid in cement mortar.

They must be laid in line and the joints struck both inside and out. The sills must be of stone or built of concrete to the satisfaction of the engineer of the Water Company. All wood work entering in the construction and exposed to the weather must be of white pine. All interior exposed wood work must be of yellow pine and surfaced, and contractor must realize that it is intended that this superstructure shall not only protect the valves, but as an ornament, lend to the appearance of the entire structure, and a neat, first class job will be expected, that is, the brick must be of an even color, they must be laid by first class building masons, and in fact, competent building tradesmen must be employed for each different feature of the work on the superstructure.

Floor joists to be 2 x 10 spaced 16" center to center. Flooring to be 1-1/2" tongue and grooved S. 1. S. yellow pine not over 3" wide. Rafters to be 2 x 6 yellow pine spaced 24" center to center. Every other pair of rafters to be tied together with a 2 x 6 V nailed to the rafters. Rafters to rest on a 2 x 10 wall plate anchored into the brick wall with 1/2" anchor bolts. A 6 x 8 yellow pine beam is to be placed directly over the cross screens at the top of the brick wall, which will be used for removing the screens. Trap doors over the cross screens and a trap door over the inside ladder are to be placed as shown on blue print. All trap doors are to be provided with lifting rings countersunk flush with the floor.

Windows are to have two single sash; sash hung on weights. All ridges and valleys on roof shall be provided with suitable zinc ridge rolls or flashing extending well under the slate. Slate to be underlaid with heavy roofing paper and securely nailed with galvanized iron nails. All painting to be done by the Water Company.

TABULATION OF BIDS FOR INTAKE PIER AT BECKS RUN STATION

SOUTH PITTSBURG WATER COMPANY

	Straight Bid	Bid for 5' extra excavation	Bid for 5' deeper with piling
Jutte & Foley Co.	9,323.88	9,844.88	10,294.88
Dravo Const. Co.	10,350.00	11,175.00	11,965.00
S.M.Bole Const.Co.	11,350.00	12,200.00	12,790.00
Robt. A. Cummins	19,000.00	19,500.00	21,100.00

The above contract let to Dravo Doyle at $10,000.00, conditioned on their excavating without cofferdam, driving piles not less than 20 feet long, sawing same off and capping with grillage, and beginning masonry at point shown by the plan. This was alternate proposition submitted by them.

The contract was originally awarded to Jutte & Foley, who refused to furnish a bond, and it was thought best to require one on account of our responsibility in connection with the tunnelling under the railroad, the working adjacent the Coal Company's boat yard, and our additional responsibility to the Government.

S P E C I F I C A T I O N S

FOR ALTERATIONS IN THE BECKS RUN PUMPING STATION OF SOUTH PITTSBURG WATER COMPANY

GENERAL INSTRUCTIONS

The drawings and these specifications are intended to embrace all labor and materials required for the completion of the alterations to the building, and will be taken as co-operating with and explaining each other, and anything shown on drawings and not mentioned in the specifications, or vice versa, will be included the same as if specified and shown, and in addition, anything which may be clearly implied as necessary for the work and the proper completion of the building will be furnished by the contractor whether directly mentioned or not. On the drawings, figures will in every case take precedence over scale dimensions, and large scale drawings over small. All materials to be the best of their several kinds and all workmanship to be of the highest grade. In general, materials, unless otherwise shown, specified, or directed, will be selected to carefully match the similar materials of the present building.

All material and workmanship will be subject to the approval of the engineer of the Water Company or his authorized agent, and his decision shall be final and binding in all cases.

The Water Company reserves the right to make any alterations or changes in the plans and specifications without affecting the validity of the contract, and should such changes involve a difference in cost, the amount thereof shall be either added or deducted from the contract price as the case may be, and no extra work involving additional cost shall be started by the contractor without first having received a written order for the same from the Engineer of the Water Company. No bills for extra work will be accepted without an order as above mentioned.

The contractor will provide all materials, labor, scaffolding, centering, tools, etc., and everything required for the full completion of his work according to these plans and specifications either embraced or implied, and after completion shall remove debris and waste material and leave building and grounds in as good condition as he found them.

The contractor will be held to bear the expense of all damage to the old portion of the building, and machinery, resulting from the work of the alterations, and all damage from same cause

to the new portion.

The contractors are required to examine site and present building as no allowance will be made for lack of knowledge of the premises.

The contractor must realize when making his bid that this work must be done without detriment or interference with the continuous operation of the pumping machinery in this station; that the water supply kept up by this station is paramount to everything concerned with the alterations to or the construction work in connection with this station.

In order to accomplish the above, the contractor must provide suitable protection for the machinery in the way of tarpaulins or equivalent, which must be spread over the entire area unroofed or exposed to the weather, and must be of such nature, construction or installation that it will not only protect the machinery and employes from the weather, dust and debris, but in addition must be of a nature that will confine the heat to the extent of keeping the station comfortable for the employes in charge of the operation, and a suggestion of the Engineer is that the above described protection be first erected over that portion of the building to be raised, and as soon as the sheathing is completed over this portion, and the slaters begin work, that the protection be removed to the highest portion of the building, which is simply to be re-roofed, and as soon as the sheathing is completed over that portion, the protection can then be removed to the boiler room, and in this manner the brick work, sheathing and slating can proceed in a continuous and uninterrupted manner. The contractor is at liberty, however, to work out any other plan that he may think better, and which shall meet with the approval of the engineer in charge of the work.

BRICK WORK

The new brick work consists of building the two side walls and one end wall of the lower portion of the pump room, to the height of the walls of the present higher portion so that the roof shall be on the same level the full length of the pump room. The present wall in the low portion is to be removed below the corbelling before starting the new work, as shown on the plans. The corbelling on the new work is to correspond with the corbelling on the present high portion of the pump room. In the up-river corner of the boiler room next to the hill where the roof overhangs the wall, the present brick wall shall be continued up to the roof sheathing. The walls of the remaining portion of the boiler house shall be built up two additional courses of brick or sufficiently to support the gutter, as shown on the plans. All brick work in the present building which has fallen

off or has become loose shall be replaced or repaired by the contractor so that the whole will present a neat appearance when finished. Where openings in the present brick work are to be made for new windows, the contractor must patch and point up neatly and bond the new brick work into the old. The walls of the above work shall be of hard burned brick of the same size and color as the brick in the present building. All salmon colored brick shall be discarded. The mortar shall be of good quality of well slacked lime mixed with sharp clean river sand, in about the proportion of one part lime and three parts sand; mortar to be colored red to correspond to mortar in present brick work. All brick must be wet before laying in the wall. The use of bats and small pieces will not be allowed except for necessary closures and no empty spaces or voids will be allowed in the walls. All arches over openings will consist of three rings of brick and must be neatly turned and built on suitable wood centers. All joints must be neatly struck both inside and outside of building, both faces presenting an equally neat appearance. All mortar and other stains shall be removed from both faces of the walls when finished. All brick shall be laid in the same bond as the present brick work and joints shall be of the same thickness.

WINDOWS

Windows of the upper row in pump room shall be pivotted or hinged at the lower ends and arranged so they can be opened and closed from the floor below. Those windows which will be prevented from opening on account of the knee braces to the girder may be made tight. All frames in these windows to be solid frames of white pine. Sash to be of white pine $1\frac{3}{4}$" thick. Finish bolts inside and outside to correspond to the finish to the present windows in the pump house. Inside casings, window jambs, aprons, and sills to be of yellow pine. Lights of the number shown on the plans to be of such size to fit the size of the openings shown in the brick work. One new window of two single sashes is to be furnished and put in place by the contractor to replace the present window in the front of the boiler room farthest up stream. This window to be hung on weights and to exactly correspond to the other front windows in the boiler room. Stone sills to correspond in every detail to the sills in the present windows will be placed under all new windows.

All trimming hardware to be furnished by the Water Company and put up by the contractor. All other hardware to be supplied and put up by the contractor.

DOORS

The contractor shall furnish and erect new doors to replace the doors in boiler and pump room on side next to the river. Doors to be of white pine and to be of same design as present doors.

ROOFS, TRUSSES, PURLINS, ETC.

The roof trusses in boiler room are to remain in their present position. The corrugated iron roof and Z bar purlins supporting it will be removed by the contractor.

Ventilator frames of design shown on plans are to be bolted or riveted to the upper cord of the present trusses. New purlins consisting of 6" channels of weights shown with 2x6 nailing pieces bolted to them will be securely bolted to the upper cords of the roof trusses. The contractor must make his own measurements for ordering these purlins. The two roof trusses nearest the down stream end of the pump room are to remain in their present position. The remaining three trusses will be raised so that the top of the roof shall be on the same level as the present higher portion, the full length of the pump room. The end frame on the truss marked "A" on the blue print is to be disconnected and removed together with the present hip trusses now riveted to the truss next to the boiler room, and the Z bar purlins supporting the corrugated iron roof. There are a number of steam pipes now running through these trusses and the contractor must disconnect such members of the trusses as will enable him to raise them without interfering with the steam pipes. Afterwards, the trusses are to be restored to their original condition. All corrugated iron on roof, ventilator, and end frame of the pump house must be removed together eith the sheathing on the high portion. New purlins consisting of 6" - eight pound channels with 2x6 nailing pieces bolted to them will be securely bolted or riveted to the upper cords of the three trusses which are to be raised. The present purlins on the high portion of the pump room to remain as they now are with the exception of the 2x6 nailing pieces, which are to be replaced by new 2x6 pieces.

New ventilator frames are to be bolted or riveted to the upper cords of the two up-stream trusses. The ventilator and purlins which are at present riveted to the end frame must be disconnected and bolted to the truss which shall be raised to take its place. The entire roof of both boiler and pump rooms, together with the roof of the ventilators shall be covered with $1\frac{1}{8}$" beaded #1 yellow pine sheathing, tongued and grooved and surfaced on under side. The 2x6 nailing strips to be of yellow pine #1 quality, free from any large or loose knots, wind shakes, or bad

places, and surfaced four sides. The sheathing shall be laid with close joints, secret nailed with 10d nails to these purlins. If the sheathing is over 4" wide it shall be beaded down the center.

SLATE ROOF

The roof shall be covered with No. 1 Bangor Slate, 10 x 20" with 3" lap, and securely nailed with copper nails not less than 1¼" long. All slate shall be underlaid with heavy roofing paper and shall be left whole and in perfect condition on completion. Broken or cracked slate will not be allowed or accepted.

VENTILATORS

The ventilator in the boiler room is entirely new and shall be of design and size shown on the plan and have roof similar to roof of main building. Ventilator sash to be of white pine 1½" thick. Lights to be of size and number shown on plan. The windows are to be arranged so they can open and close from the floor below. The new portion of the ventilator in the pump room to be of the same size and general design as the portion now in place. Sash to be of white pine and same height as sash in present ventilator. The length of the sash, however, will have to be shorter on account of the different spacing of the roof trusses. The lights will, if possible, be the same size as the lights in the present sash. The ends of both ventilators to be sheathed with 7/8" white pine, sheathing to be laid diagonally. Windows of ventilator in pump room, both old and new, to be provided with means of opening and closing either from the pump platforms or from the floor below, whichever is more convenient. All wood work in ventilators exposed to the weather to be of white pine.

GUTTERS AND FLASHING

The gutter is to be of 16 oz. copper and extend well under the slate, is to be fastened securely to the sheathing by straps, spaced not less than 36" center to center. It shall be given the proper grade so that it will drain towards the down spouts. The cornices to be of crimped galvanized iron or steel securely fastened at the top to the gutter with copper rivets, and nailed to the nailing strip at the bottom with copper nails. Any portion of the cornice now on the building, which in the judgment of the Engineer of the Water Company, is in first class condition, can be used, providing that the new cornice shall exactly match it. A copper flashing shall be placed in the roof around each stack with a clearance of 1" between the stack and the collar,

which shall have a vertical projection of not less than 4" and shall extend under the slate sufficiently to be water-tight. The intersection of all roofs shall be provided with suitable copper ridge roll. The intersection of all buildings with roofs, and ventilators with roofs, shall be provided with a suitable copper flashing or gutter.

All copper used shall be of 16 oz. per sq.ft.gauge.

DOWN SPOUTS

The contractor shall provide and put in place at the proper time ten 4" galvanized iron down spouts, in the positions shown on the drawing.

The down spouts shall terminate about four feet above the water table in cast iron spouts, similar to those now on building, and end just below the top of the water table. The contractor may use such of the present C.I. spouts as are in good condition. Down spouts to be securely fastened to the walls of building.

FLOORS

The floor in the present pump room is to be removed and replaced on the present joists with #1 yellow pine flooring 1-1/8 thick and not more than 3" wide, to be riff sawed and have all defects cut out, laid close and secret nailed to every bearing. Openings in the floor and trap doors to be left as at present, and any additional trap doors or openings are to be left in the floor as may be decided upon during construction. All trap doors to be provided with iron rings or handles sunk flush with the floor.

New floor joists shall be furnished and erected by the contractor to replace all joists which in the judgment of the Water Company are unsound. New joists to be 3 x 10 yellow pine. The contractor will name a price per thousand feet B.M. for this work.

CRANES, GIRDERS AND POSTS

The present crane run-way is to be continued to the up stream end of the pump house. Cranes, girders, rails and supporting columns, together with all necessary bolts, washers, braces, etc., will be furnished and erected by the contractor according to the detailed plans. The steel used in this work shall have a tensile strength of from 54,000 to 62,000 pounds per square inch and an elastic limit of not less than 1/2 the ultimate strength.

All rivets shall be made of soft steel and driven hot so they will completely fill the rivet holes. All rivets to be 3/4",

holes 13/16", unless otherwise shown on the plan. Bolts may be used instead of rivets for field work.

In spacing the columns the measurements are to be made from the center of the last column now in place. Columns are to be securely anchored to the walls of the building as shown on plans.

GLASS

All glass to be of American double strength window glass. All glass to be back puttied and bradded in. To be left whole at completion of building.

PAINTING

All outside woodwork shall receive one priming coat as soon as in place, and all window frames as soon as they have been inspected.

All outside woodwork both old and new shall finally receive two coats of paint made of pure linseed oil and white lead, of a color selected by the Engineer of the Water Company. All cornices and down spouts shall receive two coats of paint. All iron work in trusses and crane runway, both old and new shall be thoroughly cleaned of all mill scale, rust, grease, mud and dirt, and shall then be thoroughly and evenly painted with two coats of the best grade of graphite or carbon thoroughly mixed and ground with pure linseed oil.

All interior woodwork in both the pump and boiler house shall be finished in natural colors, with one coat of filler and two coats of hard oil finish.

The above buildings shall be enclosed within _____ days from the signing of this contract, and shall be completed within _____ days from the signing of the contract.

BIDS RECEIVED ON THE ALTERATION OF

THE BECKS RUN PUMP STATION

Hill Construction Company,	$7,499.19
Pittsburg Construction Company,	12,500.00
William Miller & Sons Company,	14,567.00

This contract was placed with the Hill Construction Co.

S P E C I F I C A T I O N S

FOR STORM SEWER THROUGH THE PROPERTY OF THE SOUTH PITTSBURG WATER COMPANY

This sewer is to be constructed to care for the storm water which falls on the valley above this property, and in as much as it will be at times subjected to a torrent, the construction must be of such quality that it will withstand the action of the water under such conditions, and also carry the maximum for the cross section proposed.

TIME

In as much as the beginning of extensive structures over this sewer awaits the completion of same, time is an important element in this contract, and the Water Company is willing to pay for expeditious work. Contractors will therefore state the least possible time in which they will guarantee to complete the work, and if at extra cost the time can be shortened, different bids based on these conditions will be considered.

MATERIALS OF EXCAVATION

The profile accompanying these specifications shows what the Water Company believes to be the stratification to be encountered in the construction of this sewer, and feels quite confident that no material variation from this stratification will be encountered.

In as much as the sewer is to be constructed principally in the limestone, and over the top and resting on this sewer is later to be erected heavy structures, contractor will be expected to excavate or shatter as little of the limestone, in addition to the cross section shown on the plan accompanying these specifications, as it is possible to do, and will be required to remove all material shattered or rendered unfit for sub-foundation for heavy structures, and to fill all excavation made with concrete or brick masonry to the satisfaction of the representative of the Water Company in charge of the work.

The desire is that the excavation be only of sufficient depth to obtain the cross section ofsewer shown after having leveled and smoothed up the bottom with masonry, as shown by the

plan, and the amount of masonry used in the bottom will be governed by the excavation made, simply bringing it to grade and smoothing up, and it is the belief of the Water Company that throughout the entire length of the sewer that a bottom of firm limestone will be encountered, but should the contractor encounter material that in the opinion of the representative of the Water Company is unfit for a bottom, he will be required to move same, and will be paid at the rate of $1.00 per yard for any such additional or extra excavation ordered, and $4.00 per cubic yard for concrete fill in such excavation, but no such excavation or fill shall be made by the contractor without a written order from the representative of the Water Company on the ground, and such written orders must accompany any claims for extras on any of the work covered by these specifications.

MATERIALS OF CONSTRUCTION

The contractor is given his choice between concrete and brick construction. If concrete is employed, it shall be composed of one part Portland cement of approved brand, two parts sand, and four parts of broken stone or well washed river gravel, all of which shall pass through a 2" ring.

If he should elect to employ brick construction, the sewer proper shall be formed of three rings of hard burned brick, neatly laid on forms in first class cement mortar, which shall be made of one part of sand, two parts of Portland cement of an approved brand, and the entire cross section excavated shall be filled to the height shown by the plan, with masonry of either well placed brick in mortar as above described, or the brick arch may be supplemented with concrete, but with either construction neat handy forms must be used, and must remain in place until the masonry over them has sufficiently set to prevent any danger from cracking, due to a too early removal of the form.

All material used in either case must be furnished by the contractor, and be passed upon and accepted by the Water Company prior to its use.

SPOIL BANKS AND BACK FILLING

No backfilling other than of masonry will be required of the contractor. The materials excavated will be deposited on the banks adjacent, to remain there subject to removal by the Water Company, and the contractor may only need figure on such expense relating to the material excavated as it will be necessary for him to incur to dispose of same on banks adjacent in a manner that will permit the uninterrupted progress of his own work, and the Water

Company will endeavor to remove any such materials as may be overburdensome to the contractor on account of his inability, owing to the cramped conditions, to dispose of same, This refers particularly to where the sewer will pass under the Coal Company's railroad.

PROTECTION OF WORK DURING PROGRESS

The work as at present laid out will cross the stream it is intended later to convey but once, and that at about midway of its length, but will again intersect such stream at its completion or upper end, and the contractor will be expected to make provision for caring for the flow of this stream and prevent its interrupting progress of this work. This stream on April 28th at the point of crossing and also intersection was not flowing at all.

QUALITY OF WORK

The work shall at all times be subject to the inspection of the Engineer of the Water Company, and shall be carried on in a first class workmanlike manner. None but the best material shall be used. Great care must be taken to preserve surfaces of masonry and rock excavation in a clean condition to promote the best adhesion, and where concrete shall have been permitted to set, a layer of mortar shall have been spread over before the next layer of concrete goes on, and bidder must understand that over this work, as before stated in these specifications, is to be constructed heavy buildings, machinery foundations, and reservoirs, and that any defective construction in this sewer might cause disastrous results, and would surely entail great loss on the Water Company.

S P E C I F I C A T I O N S

FOR THREE 5,000,000 GALLON PUMPING ENGINES

FOR THE HAYS STATION PLANT OF THE

SOUTH PITTSBURG WATER COMPANY

CONDITIONS OF SERVICE

The water to be handled will be filtered. The suction will be taken from an open well beneath a portion of the floor of the pumping station.

The pumps must be proportioned for a steam pressure of 135 pounds at the throttle, and a water pressure in the discharge main at the floor level of 185 pounds. They must be constructed throughout for a continuous working pressure of 200 pounds in the discharge main at the pump station floor level.

The delivery will be into the discharge mains and a standpipe.

TYPE

Pumps to be of a type that will give an every day duty of not less than 90,000,000 foot pounds for each 1,000 pounds of dry steam consumed by the engine when running at rated capacity.

CAPACITY

Pumps to have a capacity of 5,000,000 U.S.gallons in 24 hours. Direct acting engines to be rated on 120 feet piston speed; crank and fly wheel engines on 250 feet piston speed per minute.

STEAM END

All steam cylinders must be jacketed throughout. Valve motion must be simple and of such design that it may be readily adjusted to all reasonable variations of steam, speed and water pressure without stopping the engine, or to the great inconvenience of the operator.

LAGGING

All directly heated surfaces, including reheaters and

cylinder heads, must be covered with some approved non-conducting material and lagged over with polished sheet steel or Russia iron not thinner than 18 gauge.

REHEATERS

The exhaust from one steam cylinder to another must pass through reheaters. Bidders will state the number of square feet to be provided in each case.

WATER END

Water ends must be of the outside packed plunger pattern and so designed as to prevent the formation of air pockets. No flat surfaces must enter into the design. All chambers must be provided with openings sufficient to afford easy access to and permit the removal of all parts and foreign substances.

Water valves must be of special design to withstand the severe service, and the detail of the same must accompany the bid. Valve area must not be less than 50% for each 100 feet of piston speed. Plungers must be cast in a chill, the effect of which must show 1/2" below finished surface, which surface msut be obtained by turning or grinding.

CONDENSER

Condenser must be of surface type, placed in the main suction in a manner that will utilize the water pumped by the main engine for circulating. It will have a cooling surface sufficient to produce a vacuum of 25", with circulating water at 70°, and operating at an elevation of 1,000 feet above sea level. The shell must be provided with hand holes conveniently located for inspecting or removing foreign substances that may collect around the outside of the tubes. The tubes must be supported in a manner that will prevent their vibrating. Provisions must also be made against their creeping. Attached air pumps will be preferred. The condenser must be guaranteed against defective material or design for two years from date of acceptance of engine. Tubes to be not less than 7/8" diameter.

HEATER

A feed water heater of approved design having sufficient heating surface to insure a temperature in feed water within 5° of the temperature of the steam must be placed in the main exhaust pipe of each engine.

PIPING

Bidders must include steam separator of approved design, direct steam connections to intermediate or low pressure cylinder, all exhaust pipe for main engine, cross suction pipe, cross discharge pipe, all necessary jacket, priming and other auxiliary small piping about the engine, and all piping, whether jacket, priming or drain, must be attached to main castings and reheaters by means of flanges, and in no case will tapping and threading of main castings be accepted. All flanges whether steam or water, must conform in outside diameter, bolt radius and drilling to standard A.S.M.E.

COUNTER

Furnish and connect up to each engine a suitable figure revolution counter.

INSPECTION

After castings have been machined and prior to the engines being assembled in erecting shop, the purchaser must be given the opportunity to inspect all main parts. Prior to this inspection no painting, filling or plugging of any kind shall be done and should such be necessary it may only be done with the consent of the Engineer of the American Water Works & Guarantee Company, but no castings that are cracked or spongy to such an extent that in the opinion of said Engineer their strength or utility is impaired, shall become a part of these machines. This clause must be in no way construed as relieving the manufacturer from further responsibility in regard to strength or defects which may develop subsequent to this inspection and prior to final acceptance, nor does it in any way modify any test for or condition of acceptance.

RIGIDITY

Prior to acceptance, each machine will be subjected to a run of two hours duration against a working pressure of 250 pounds, and will be expected to operate under this pressure smoothly, without jar or undue vibration or breathing of castings. In fact, under these conditions no member or part shall show any sign of weakness or distress, and the entire machine must be guaranteed against defective workmanship or material for one year from date of acceptance.

BIDS

Prices on direct acting engines to be F.O.B.cars, South Side, Pittsburg; on crank and fly wheel engines, erected on foundations furnished by Water Company, and conditioned on the hauling being done by the South Pittsburg Water Company.

FINISH

The finish must be such as should be reasonably expected of a first class machine, a large area of polished surface is not expected, but sufficient amount must be done to lend to the machine a real respectable appearance. The castings must be smooth and free from blow holes or cold shuts; all flanges must match; all nuts subject to frequent removal must be case-hardened. The general design must be such that it will not pocket condensation or oil, provision must be made to catch all drips and prevent same from marring appearance of machine, and all valves controlling the starting and general operation of the engine must be controlled from one point, and necessary platforms and stairs for rendering all control readily accessible must be provided.

PLANS AND SPECIFICATIONS

The station in which these engines will be erected has not yet been designed, but a building to contain five such units is contemplated.

Bidders will be expected to furnish sufficient plans and specifications to give purchasers intelligent ideas of machine submitted, space occupied, size of foundation, and after machine is shipped, a complete set of detail plans mounted on cloth.

It is not the intent of these specifications to materially interfere with the standard patterns of pump builders, but to secure a reasonable uniformity and to enable purchasers to make an intelligent comparison and serve as a general outline and guide to bidders.

ALTERNATE BID

Builders of machinery not in accord with the above specifications are invited to submit proposals on the machines they manufacture, in their opinion adaptable to the conditions as outlined, and to provide detailed specifications and drawing of such machine.

DELIVERY

Time will be an important element in the contract for this machine, and bidder will state when they are certain they can ship machine upon which they submit bids.

- BIDS FOR -

HORIZONTAL CROSS COMPOUND PUMPING ENGINES

Name of Bidder	Size	Price Erected
Nordberg Mfg. Co.	25 & 50 x 13¼ x 36	$58,730.00
Snow Steam Pump Co.	24 & 54 x 13½ x 36	53,000.00
Robt. Wetherall & Co.	28 & 56 x 14 x 30	69,390.00
Allis Chalmers Co.	22 & 46 x 12½ x 36	69,750.00
Mesta Machine Co.	30 & 60 x 16½ x 30	68,000.00
Wm. Tod Co.	26 & 52 x 13½ x 42	79,000.00
Allis Chalmers (Alt.Bid)	26 & 52 x 15½ x 36	79,572.00
R.D.Wood & Co.	26 & 52 x 13½ x 48	94,500.00

BIDS FOR

3 - 5 Mil. GAL. DIRECT ACTING TRIPLE EXPANSION PUMPING ENGINES

Name of Bidder	Size	Price fob S.S.	Duty
Epping Carpenter Co.	19&30&50 x 19 x 36	$38,500.00	90 Mil.
Fred M.Prescott Co.	18&28&47 x 19¼x 24	28,000.00	90 Mil.
R.D.Wood & Co.	18&28&47 x 19½x 24	28,000.00	90 Mil.
H.R.Worthington	19&30&50 x 19½x 24	45,000.00	90 Mil.

Contract was awarded to R.D.Wood & Company.

S P E C I F I C A T I O N S

FOR COAGULANT HOUSE FOR

SOUTH PITTSBURG WATER COMPANY

GENERAL INSTRUCTIONS

The drawings and these specifications are intended to embrace all labor and material required for the completion of the coagulant house on the grounds of the South Pittsburg Water Company located near the intersection of Agnew Avenue and Becks Run Road in Baldwin Township, and will be taken as co-operating with and explaining each other, and anything shown on drawings and not mentioned in the specifications, and vice versa, will be included the same as if specified and shown, and in addition, anything which may be clearly implied as necessary to the work and the proper completion of the building, will be furnished by the contractor whether directly mentioned or not. On all drawings, figures in every case will take precedence over scale dimensions and large scale drawings over small. All materials to be the best of their several kinds and all workmanship to be of the highest grade. Material and workmanship will be subject to the approval of the Engineer of the Water Company, or his authorized agent. The Water Company reserves the right to make any alterations or changes in the plans and these specifications without affecting the validity of the contract and should such changes involve a difference in cost, the amount thereof shall be either added or deducted from the contract price as the case may be, and no extra work involving additional cost shall be started by the contractor without first having received a written order for the same from the Engineer of the Water Company. No such changes, extras or deductions shall in any way invalidate the contractor's bond or extend the time for enclosing or completing building unless so stipulated. No bills for extra work will be accepted without an order as above mentioned. All official building laws and ordinances are to be considered as part of these specifications and therefore complied with. The contractor will obtain and pay for all necessary permits and licenses, etc., in connection with this work. The contractor will provide all necessary material, labor, scaffolding, centering, tools, etc., and everything required for the full completion of this work according to the plans and these specifications either embraced or implied, and after completion shall remove all debris and waste

lumber and leave buildings and grounds in as good condition as he found them. The contractor will be held to bear the expense of all damage to the existing work resulting from the work of the new buildings. The bidders are required to examine site and present foundations as no allowance will be made for lack of knowledge of the premises.

FOUNDATIONS

The foundations up to the bottom of the water table will be put in by the Water Company. The concrete piers supporting the 10 x 12 beam on which the floor joists rest will be put in by the Water Company, as will also the concrete portion of the area way up to the bottom of the stone coping.

STONE WORK

All stone work shall be of Bedford limestone of uniform color. All exposed surfaces of stone shall be rubbed smooth and free from all tool or rust marks. The belt course or water table is to be of stone 8" thick, with 6" bed, with 1" chamfer, cut at top. Stone sills 5" thick, cut with wash and drip projection shall be placed under all windows, as shown by plan. Stone sills extending the full width of the wall, shall be placed under both doors. A 6" stone coping to be placed on top of the area way which leads into the basement. Both edges of same to be chamfered 1". A 4" stone coping to conform to other exposed stone surfaces is to be placed on top of all brick walls, as shown on plans. All sills shall be only approximately the dimensions specified and shall be required to properly join with the brick work. No coping or water table stone, unless for closure or dimension stone shall be less than 4' in length. All stone work shall be laid on a natural bed and set level to a perfectly true horizontal line.

BRICK WORK

All exterior surfaces of walls are to be faced with buff Falston front brick, as per sample "J" submitted by the Pope Cement and Brick Company, to cost $16.50 per thousand, F.O.B. Becks Run or 23rd Street Siding. All other brick in walls to be of hard burned common brick from which all salmon colored brick shall be discarded and no empty spaces or voids will be allowed in the wall. All face work shall be bonded every seventh course by a chip or diagonal secret bond or blind header.

All buff faced brick shall be laid with full butter joints struck and trimmed. Vertical and horizontal joints shall not be over 3/16" thick. Horizontal joints shall be laid to line and perfectly level. Vertical joints shall be perfectly plumb, and all work shall be true and even at the intersection of stone sills. Brick on the interior of the walls are to be laid to line with joints neatly struck. All brick must be wet before laying in the walls if so directed by the Engineer of the Water Company. All arches over openings must be neatly turned and built on suitable wood centers. The Water Company will furnish all common red brick necessary for the erection of this building at the site of the building free of charge to the contractor.

Mortar for all common brick shall be composed of one part Portland cement and four parts Allegheny River sand free from coal, tempered with one part of lime in eight parts of cement mortar. The mortar for the face brick shall be composed of white rock sand and clear, well slaked lime, and tempered with sufficient Portland cement to give it a perfectly hard and practically impervious surface when thoroughly set.

The contractor will furnish and place in walls all necessary wood brick and sub-sills, all to be of well seasoned lumber. At the completion of the building all mortar and other stains shall be removed from both faces of all walls.

CARPENTER AND MILL WORK

WINDOWS AND DOORS

Window sash to be of white pine $1\frac{3}{4}$" thick. Lower sash to be hung to upper sash on both sides by means of chains passing over pulleys secured to the sides of the frames. Window frames to be solid white pine frames $1\frac{3}{4}$" thick, rebated for sash and finished with molding on the outside. Frames on inside are to be finished with a quarter round, which shall be flush with the face of the wall. Doors to be of white pine 2" thick with transom over the top, and paneled as shown on the elevation. Door frames to be of white pine $1\frac{3}{4}$" thick with molding on the outside. The Water Company will furnish and put in place door and door frame in basement of building.

JOISTS AND FLOORING

All floor joists are to be 2 x 12 yellow pine spaced 12" C. to C. A 10 x 12 yellow pine timber for supporting these joists in the center is to be placed as shown on the drawing. All trimmers and headers around all openings shall be doubled.

All joists shall be cross bridged with 1 x 3 stuff at intervals not to exceed six feet. The entire floor is to be covered with 2" yellow pine flooring not over 3½" in width. Provide trap doors in floor as shown or as may be directed. Trap doors to be hinged and provided with counter sunk rings for lifting.

STAIRS

Construct stairway from first floor to basement as shown on drawing, same to be supported by 2" carriages. These stairs to have molded yellow pine strings and 1-1/8" yellow pine treads with round nosings. Risers shall be of 7/8" yellow pine.

RAILING

Provide and erect iron railing around the stair openings and stairs. Railing and posts to be of 1½" wrot iron pipe. Posts to be secured at the bottom by means of pipe flanges securely fastened to the floor or stairs.

ROOF TRUSSES

Roof trusses to be of design shown on plans. Lumber used in same to be yellow pine S 4 S. The contractor shall furnish all cast iron washers, both beveled and flat, all rods, bolts and nuts for same necessary to construct truss. All rods to be of good sound iron free from any flaws, with clean cut threads. Designs for beveled washers to be subject to the approval of the Engineer of the Water Company.

RAFTERS AND PURLINS

Purlins to be 8 x 10 yellow pine S 4 S securely bolted to the trusses, as shown on plans. All rafters are to be 2 x 8 yellow pine S 4 S spaced 24" C. to C. Hip rafters are to be doubled. Wall plate on which rafters rest to be bolted into brick work with 3/4" anchor bolts 18" long, spaced not more than 4-1/2 feet C. to C. Wall plate on which trusses rest shall be secured to the brick work by means of anchor bolts, as shown on plans.

ROOFING

The entire roof of building is to be covered with 1¼" yellow pine tongue and grooved beaded sheathing, secret nailed

at every bearing.

MATERIALS

All exterior finish, unless otherwise specified, shall be strictly first class quality of thoroughly seasoned white pine, perfectly free from knots and pitchy places. All interior wood work, unless otherwise specified, shall be of perfectly sound, thoroughly kiln dried yellow pine, free from large or loose knots, windshakes or other imperfections which would weaken or injure the appearance of the work.

DOOR SILLS

The contractor shall furnish and put in place cast iron door sills with roughened, checkered treads under both outside doors. Door sills to be at least 4" longer than the width of the opening. Design for same to be approved by the Engineer of the Water Company.

SLATE

The entire roof of building shall be covered with #1 Bangor slate 10 x 20" with 3" lap, and securely nailed to the sheathing with copper nails not less than 1¼" long. All slate shall be underlaid with heavy roofing paper and shall be left whole and in perfect condition on completion. Broken or cracked slate will not be allowed or accepted.

FLASHING AND DOWNSPOUTS

The intersection of all roofs with all brick walls shall be flashed with copper flashing to the height shown on drawing, forming a gutter around the entire building. All gutters are to be counterflashed as directed. The intersection of all roofs shall have a suitable copper ridge roll with wood center. Provide and put in place 4" square copper downspouts at locations indicated on drawings, or as may be directed by the Engineer. The 4" conductor from the gutter shall be properly flashed at the intersection with the roof and shall terminate on the outside of the wall with an ornamental conductor head of design to be approved by the Engineer of the Water Company. Provide and put in place one 18" copper ventilator of design similar to those on existing building. All copper used for the above work shall weigh not less than 16 ounces per square foot. Conductors to terminate about two feet above the grade line in cast iron down spouts 4"

square. Where necessary these downspouts are to be cast with all necessary bends or off-sets to clear any projections. The contractor will connect the downspouts by means of a 4" cast iron pipe to the sewers, which will be laid by the Water Company, leaving the necessary openings for the down spouts.

HARDWARE

The contractor will furnish and put in place the necessary pulleys and steel chains for operating the windows. Use #96 factory pulley on each side of the window with #1 steel chain. The contractor will also furnish the hinges and lifting rings for all trap doors shown. All finishing hardware other than that specified, including hardware for the basement door, shall be furnished by the Water Company and put in place by the Contractor.

PAINTING

All exterior wood work, unless otherwise specified, shall receive a prime coat as soon as in place and the window and door frames as soon as they have been inspected and accepted. All exterior wood work shall finally receive three coats of paint made of pure linseed oil and white lead of the color to be selected by the Engineer of the Water Company. All exposed interior wood work shall receive one priming coat and two coats of paint made of pure linseed oil and white lead, All knot holes and pitchy places must be shellaced before painting. All nail holes and other places shall be putty stopped after the first coat. All iron work must be thoroughly cleaned and then shall be painted with two coats of the best graphite or carbon thoroughly mixed in linseed oil.

GLAZING

All glass used throughout the building shall be A.A.D.S.American Window Glass. All windows and transoms to have the number of lights shown on the elevation plans. All glass to be back-puttied and bradded in and to be left whole on the completion of the building. The above building shall be enclosed within _____ days of the signing of the contract and finished within_____ days of the signing of the contract.

BIDS RECEIVED ON THE CONSTRUCTION OF THE SUPER-STRUCTURE OF THE ALUM HOUSE FOR THE FILTER PLANT OF THE SOUTH PITTSBURG WATER COMPANY

Snee Brothers,	$3,194.00
J.W.Undercoffer,	3,200.00
Harry Clouser,	3,685.00
Monongahela Construction Company,	3,800.00
John Seibert & Sons,	4,212.00
Pittsburg Construction Company,	5,200.00

This contract was placed with Snee Brothers.

S P E C I F I C A T I O N S

FOR WASH WATER TANK FOR

SOUTH PITTSBURG WATER COMPANY

GENERAL

The plan and these specifications are intended to cover the furnishing of all labor and material necessary for the erection of a tank on foundations furnished by the Water Company on the grounds of the South Pittsburg Water Company, located near the intersection of Agnew Avenue and the Becks Run Road in Baldwin Township.

SIZE OF TANK

Tank to be 42 ft. inside diameter and 30 ft. high.

PLATES AND ANGLES

Bottom,	3/8" thick
1st and 2nd rings,	7/16" "
3rd and 4th "	3/8" "
5th and 6th "	5/16" "
Bottom angle,	4 x 4 x 1/2"
Top angle,	4 x 3 x 1/2"

JOINTS

All verticle joints shall be double lap riveted. All horizontal joints shall be single lap riveted.

SIZE OF RIVETS

Bottom angle and bottom,	3/4" rivets
1st and 2nd rings,	3/4" "
3rd and 4th "	3/4" "
5th and 6th "	5/8" "

SPACING OF RIVETS

1st and 2nd rings,	2-1/2" pitch
3rd and 4th "	2-3/4" "
5th and 6th "	2-1/2" "

RIVETING

All rivet holes are to be punched 1/16" larger than the size of the rivet. All rivets are to be driven hot and sufficient stock must be provided in the rivets to completely fill the holes and make a full head. Loose rivets must be promptly replaced. No rivet caulking will be permitted.

CAULKING

All caulking edges to be bevel sheared. All seams must be caulked thoroughly tight with a round nosed caulking tool by workmen of acceptable skill. Great care must be taken not to injure the under plate.

WORKMANSHIP

All workmanship must be first class in every particular. Defective workmanship and material may be rejected at any stage of the work by the Engineer of the Water Company or his authorized agent, and must be properly replaced by the tank contractor as directed.

PAINTING

After the structure is erected, all metal work shall be thoroughly cleaned of all mill scale, rust, grease, dirt and mud, either by sand blast or by scraping with wire brushes. The exterior is then to be thoroughly and evenly painted with two coats of the very best grade of graphite or carbon, thoroughly mixed and ground in linseed oil containing no admixture of rosin, oil petroleum products, or other adulterants.

The kind or brand of paint shall be subject to the approval of the Engineer of the Water Company.

Before lowering, the bottom is to be given a coat of asphaltum paint on the underside. The upper side of the bottom must then be covered with a layer of asphalt to an even depth that will over-top all laps or rivet heads at least 1/4 of an inch.

The interior of the tank is to be thoroughly and evenly coated with one coat of asphaltum paint.

LADDER

Provide ladder on the outside from top to within 10 feet of bottom. Ladder to have 3/4" rungs with vertical pieces of 1/2" by 2" iron and shall be secured to the tank at intervals of every ten feet.

OPENINGS

Provide and rivet to the bottom of the tank cast steel necks of sizes and design shown on the drawing. Also provide and rivet to the tank manhole not less than 20 inches in diameter, of design to be submitted to and approved by the Engineer of the Water Company. Manhole to be placed in bottom ring of tank.

PIPING

Provide and put in place 10" wrought iron over-flow pipe terminating at the top with a funnel made of No. 10 iron, all as shown on the drawing, to be braced to the tank as shown.

STRENGTHENING

Where horizontal leg of top angle butts, it shall be reinforced by a strap 3-1/2" wide by 1/2" thick, attached to the end of each angle by not less than six 3/4" rivets.

MATERIAL

All plates to be of open hearth steel and to have a tensile strength of from sixty to sixty-four thousand lbs. per square inch, and an elastic limit of not less than half of the ultimate strength.

Material for rivets shall be soft open hearth steel with a tensile strength of from fifty to fifty-five thousand lbs. per square inch.

All plates must be free from laminations and surface defects, and shall be rolled truly to the specified thicknesses.

TESTING

Bottom to be tested with not less than 6 inches of water before being lowered on to the foundation. Tank to be tested with water furnished by and at the expense of the Water Company within two weeks from date of completion.

The builder must guarantee the tank to be tight under full pressure and to make good any defects in workmanship or material developing within one year from date of completion.

BIDS RECEIVED ON WASH WATER TANK FOR

SOUTH PITTSBURG WATER COMPANY

SIZE: 42' DIAMETER BY 30' HIGH

R. Monroe & Son,	3,400.00
Petroleum Iron Works,	3,900.00
Meehan Boiler Co.,	4,026.00
Tippett & Wood,	4,230.00
Riter & Conley,	4,375.00
Reeves Bros. Company, on Standpipe and this Tank,	19,100.00

This contract was placed with R. Monroe & Son.

S P E C I F I C A T I O N S

FOR STAND-PIPE FOR

SOUTH PITTSBURG WATER COMPANY

GENERAL

The drawing and these specifications are intended to cover all labor and material required for the completion of a stand-pipe to be built on foundations furnished by the Water Company on the grounds of the South Pittsburg Water Company located near the corner of Amanda and Southern Avenues in Mount Oliver. The anchor bolts shown will be furnished by the Water Company.

SIZE OF STAND-PIPE

Twenty-five feet inside diameter and one hundred and fifty feet high.

PLATES, ANGLES AND "Z" BARS

Bottom	3/8" thick
1st and 2nd rings,	15/16" "
3rd " 4th "	7/8" "
5th " 6th "	13/16" "
7th " 8th "	3/4" "
9th " 10th "	11/16" "
11th " 12th "	5/8" "
13th to 18th " inclusive,	9/16" "
19th and 20th "	1/2" "
21st " 22nd "	7/16" "
23rd " 24th "	3/8" "
25th " 26th "	5/16" "
27th to 30th " inclusive,	1/4" "

Bottom angle 6x6x5/8". Top "Z" bars 5", weighing 13.9 lbs. per foot.

JOINTS

The vertical joints from the 1st to the 15th rings inclusive, shall be double welt, triple riveted, butt joints, with the inner strap extending far enough beyond the outer strap to introduce the third row of rivets which are to be in double pitch.

Inside straps to be not less than 9/16" thick. Outside straps to be one-half the thickness of the plate to which they are riveted, but in no case to be less than 3/8" thick.

The vertical seams of the 16th, 17th, and 18th rings are to be triple lap riveted. The vertical seams from the 19th to the 30th rings, inclusive, are to be double lap riveted.

The bottom angle is to be riveted to the shell and bottom with a double row of rivets.

All horizontal seams shall be single lap riveted.

SIZE OF RIVETS

Bottom ----------3/4" rivets
Bottom angle and 1st to 15th rings, inclusive,---------- 1" "
16th to 18th rings, inclusive, ----------7/8" "
19th to 24th " " ----------3/4" "
25th to 30th " " ----------5/8" "
Anchor bracket web and angles, ----------3/4" "

PITCH OF RIVETS

1st and 2nd rings, two inner rows, 3-3/4" pitch, outer row 7-1/2"
3rd " 4th rings, " " " 4" " " " 8"
5th " 6th rings, " " " 4-1/4" " " " 8-1/2"
7th " 8th rings, " " " 4-1/4" " " " 8-1/2"
9th " 10th rings, " " " 4-1/4" " " " 8-1/2"
11th " 12th rings, " " " 4-1/4" " " " 8-1/2"
13,14" 15th rings, " " " 4-1/4" " " " 8-1/2"
16th, 17th and 18th rings, 3-3/4" pitch.
19th and 20th rings, 2-1/4" "
21st and 22nd rings, 2-1/2" "
23rd and 24th rings, 2-3/4" "
25th and 26th rings, 2-1/2" "
27th, 28th, 29th and 30th rings, 2-3/4" pitch.

RIVETING

Rivet holes shall be 1/16" larger than the size of the rivet. Rivet holes in plates having a thickness of 3/4" and over shall either be drilled or, if punched, shall be reamed not less than 1/8" larger than the die sides of the holes and sharp edges shall be trimmed. All rivets shall be driven hot and sufficient stock must be provided in the rivets to completely fill the holes and make a full head. Loose rivets must be promptly replaced and

no rivet caulking will be permitted.

CAULKING

All caulking edges must be bevel sheared. All seams must be thoroughly caulked tight with a round nosed caulking tool by workmen of acceptable skill. Great care must be taken not to injure the under plate.

WORKMANSHIP

All workmanship must be first class in every particular. Defective workmanship and material may be rejected at any stage of the work by the Engineer of the Water Company, or his authorized agent, and must be properly replaced by the tank contractor as directed.

PAINTING

After the structure is erected, all metal work shall be thoroughly cleaned of all mill scale, rust, grease, dirt and mud, either by sand blast or by scraping with wire brushes. The exterior is then to be thoroughly and evenly painted with two coats of the very best grade of graphite or carbon, thoroughly mixed and ground in linseed oil containing no admixture of rosin, oil petroleum products or other adulterants.

The kind or brand of paint shall be subject to the approval of the Engineer of the Water Company.

Before lowering, the bottom is to be given a coat of asphaltum paint on the underside. The upper side of the bottom must then be covered with a layer of asphalt to an even depth that will over-top all laps or rivet heads at least one-fourth of an inch.

The interior of the standpipe is to be thoroughly and evenly coated with one coat of asphaltum paint.

LADDER

Provide tank on the outside from top to within ten feet of the ground with ladder having 3/4" rungs with vertical pieces of 1/2 x 2" iron. Ladder to be secured to the tank every ten feet.

ANCHORAGE

Provide brackets for the reception of the anchor bolts as shown by detail on the plans. These brackets are to be riveted to the tank after it is in position.

OPENINGS

Provide and rivet to the bottom of the standpipe cast steel necks, for inlet, outlet and drain pipes, of sizes and design shown on the drawing. Also provide and rivet to the tank manhole not less than 20" in diameter of design to be submitted to and approved by the Engineer of the Water Company. Manhole to be placed in bottom ring of tank.

PIPING

Provide and put in place 20" riveted steel inlet pipe 3/16" thick to a height of 100 feet, as shown on the plan, to be braced to the side every 15 feet. Provide cast iron outlet pipe as shown by plan. All flanges are to be faced and drilled A.S.M.E. standard, as shown.

STRENGTHENING

Where "Z" bars at top of standpipe butt they shall be reinforced by a strap attached by not less than six rivets to the end of each "Z" bar. The "Z" bars on the inside and outside shall break joints. The plate which is cut for the manhole in the bottom ring shall be reinforced on the inside by a 4 x 4 x 1/2" angle riveted to the manhole casting through the shell of the standpipe.

Where angle butts it shall be reinforced by 4-1/2 x 1/2" strap attached by not less than six rivets to each end of the angle.

MATERIAL

All plates to be of open hearth steel and have a tensile strength of from sixty to sixty-four thousand pounds per square inch, and an elastic limit of not less than half of the ultimate strength.

Material for rivets shall be of soft open hearth steel with a tensile strength of from forty-five thousand to fifty

thousand pounds per square inch.

All plates must be free from laminations and surface defects and shall be rolled truly to the specified thickness.

TESTING

Bottom to be tested with not less than 6 inches of water before being lowered on to foundation. Tank to be tested with water furnished by and at the expense of the Water Company within two weeks from date of completion.

The builder must guarantee the tank to be tight under full pressure and to make good any defect in workmanship or material developing within one year from date of completion.

BIDS RECEIVED ON STANDPIPE TO BE ERECTED

ON MT. OLIVER FOR THE SOUTH PITTSBURG WATER COMPANY

SIZE: 25' DIAMETER BY 150' HIGH

R. Monroe & Sons,	12,995.00
Meehan Boiler Construction Co.	13,834.00
Petroleum Iron Works,	14,300.00
Riter & Conley Mfg. Company,	15,780.00
Tippett & Wood,	16,150.00
Reeves Bros Co. on Standpipe and Wash Tank,	19,100.00

This contract was placed with R.Monroe & Sons.

S P E C I F I C A T I O N S

FOR STEEL FORCE MAIN FOR

SOUTH PITTSBURG WATER COMPANY

GENERAL

The drawings and these specifications are intended to cover the furnishing of all materials, manufacturing, coating and testing of all piping, steel castings, pipe flanges, blank flanges, and air chamber, as shown on the drawings or hereinafter mentioned.

SIZES OF PIPE

The pipe is to be of the sizes shown on the drawings, and the size of pipe as shown is to be measured on the inside diameter of the pipe at its least diameter.

PLATES

Air Chamber	11/16" thick
24" Pipe	3/8" "
30" Pipe	1/2" "

SIZE OF RIVETS

For 1/2" Plates, 1" rivets;
" 11/16" " 1" "
" 3/8" " 3/4" ", except rivets in flanges, which are to be 1" in diameter.

PITCH OF RIVETS

Longitudinal Seams

For 11/16" plates,	3" pitch
" 1/2" "	3-3/4" "
" 3/8" "	2-3/4" "

The pitch may be varied sufficiently to allow an even number of divisions in each seam or joint. Girth seams to be standard tank spacing.

MATERIAL

All plates to be of open hearth steel and to have a tensile strength of from 55,000 to 65,000 pounds per square inch, and an elastic limit of not less than one-half of the ultimate strength. The plates used for the flanges shall have the same tensile strength as plates for the pipe.

Material for rivets to be of soft open hearth steel and have a tensile strength of from 48,000 to 58,000 pounds per square inch, and an elastic limit of not less than half of the ultimate strength. All plates must be free from laminations and surface defects and shall be rolled truly to the specified thicknesses.

RIVETING

Rivet holes shall be 1/16" larger than the size of the rivet when cold. All rivets shall be driven hot and sufficient stock must be provided in the rivets to completely fill the holes and make a full head. Loose rivets must be promptly replaced and no rivet caulking will be permitted. All caulking edges must be bevel planed. All seams must be caulked tight with a round nose caulking tool by workmen of acceptable skill. Great care must be taken not to injure the under plate.

FLANGES

Flanges for uniting sections of pipe and air chamber are to be of steel pressed from a single sheet. They are to be of design and dimensions shown on the drawing. The edges of flanges which are in contact with the pipe are to be bevel sheared or planed and caulked tight. Blind flanges are to be of sheet steel pressed out to a dish shaped form. All bolt holes in flanges are to be drilled. The face of flanges must be in plane which shall be perpendicular to axis of pipe at ends of sections.

JOINTS

All longitudinal joints shall be double lap riveted; all girth seams shall be single lap riveted. All longitudinal seams of the adjacent courses in Section 11 and 111 shall alternate to the right and left about the tor axis, as near to it as possible. The caulking edges of longitudinal seams to be in line and face upwards.

All longitudinal seams of adjacent courses in Section 1 shall alternate right and left about an axis at 45 deg. with the

bottom axis and the left hand horizontal axis looking in the direction of flow, as close to it as practicable. Caulking edges to face upwards. The pipe is to be made with taper joints, that is, each course shall enter inside the end of the course next ahead in the direction of the flow of water, as indicated by arrows on the drawing.

LENGTH OF SECTIONS

The pipe line is to be made up in sections with pressed steel flanges riveted to each end. These sections are to be from 25 feet to 30 feet in length, face to face of flanges, unless they are otherwise shown on the drawing, or it is necessary on curves or to bring flanges and openings at the locations shown on the drawing.

The contractor shall submit to the Water Company in duplicate, detail plans showing the location of each section of pipe, which shall be numbered or otherwise marked to correspond to the same number or mark painted on the corresponding section of pipe.

CURVES

Where changes in alignment or grade of the pipe are shown, they shall be formed by cutting and beveling the ends of a sufficient number of rings or courses to produce the desired total deflection or curvature.

STEEL CASTINGS

All connections larger than 4" in diameter for gates and branches, as shown on drawings, shall be made by means of close fitting steel castings of the dimensions shown, double riveted and caulked to the pipe. The section of pipe which is cut out for these castings shall be made smooth and true, and give a smooth even surface for water way. At its free end the castings shall have a flange, which is to be faced and drilled. The dimensions and drilling shall conform to the "Manufacturers' Extra Heavy Standard."

Steel castings shall be smooth and true to dimensions, and free from all defects or imperfections of any kind and shall be sufficiently thick to withstand a working pressure of 200 pounds per square inch. A 4" malleable iron pipe flange tapped for 4" wrot iron pipe is to be riveted to 30" pipe where shown.

TESTING

After each section of pipe has been riveted together in the shop, and before the protective coating has been applied, it shall be tested by hydraulic pressure at 200 pounds per square inch. All such tests shall be made by the pipe contractor, who shall supply the necessary water, apparatus, caps and appliances. All leakage shall be made tight under pressure by suitable caulking with the proper tools. If the leaks are numerous, and of a nature not to be well repaired, the whole section shall be rejected.

CLEANING

After the pipe shall have been tested and made perfectly water tight, it shall be thoroughly cleaned of all moisture, rust, mill scale, dust, earth and foreign substances, both inside and out, either by the sand blast or by wire brushing.

PROTECTIVE COATING

All piping, together with all fittings and specials, after cleaning, shall be immediately heated to 350 deg. F., after which is shall be dipped vertically, and thoroughly immersed in a bath of "Special Pipe Coating" manufactured by the American Asphalt and Rubber Company, of Chicago, Illinois. The bath shall be heated in such a manner as to insure a constant temperature of 350 deg. or such other temperature as may be demonstrated as best adapted for this purpose. The pipe shall remain in the bath until it is thoroughly coated. The thickness of the coat not to be less than 1/64". The protective coating shall be durable, smooth and hard, yet tough, elastic and strongly adhesive to the metal, and it shall be free from blisters and bubbles, and shall be thoroughly water proof. The coating shall not become soft enough to flow when exposed to the sun in summer, or brittle enough to crack and scale off at a temperature below zero.

WORKMANSHIP

All workmanship must be first class in every particular. Defective workmanship and material may be rejected at any stage of the work by the Engineer of the Water Company, or his authorized Agent, and must be promptly replaced by the pipe contractor as directed.

BIDS RECEIVED ON FILTER BUILDING AND

PUMP STATION FOR

SOUTH PITTSBURG WATER COMPANY

Pittsburg Construction Company,	$34,000.00
Wm. Kerr & Sons,	37,000.00
Wm. Miller & Sons Company,	38,000.00
Kerr & Fox,	39,485.00
Henry Shenk Company,	40,800.00
A.& S.Wilson Company,	41,489.00

This contract was placed with the Pittsburg Construction Co.

S P E C I F I C A T I O N S

FOR PORTLAND CEMENT

FOR THE SOUTH PITTSBURG WATER COMPANY

FINENESS

92% by weight of cement shall pass a #100 sieve, 10,000 meshes per sq.in.

TIME OF SETTING

A pat of neat cement made with enough water for plasticity, two or three inches in diameter, one-half inch thick, shall not take on an initial set in less than one hour.

TENSILE STRENGTH

Neat. 1 day in air, 6 days in water, not less than 400# per sq.in. 1 day in air, 14 days in water, not less than 500# per sq.in.

1 cement 3 sand (by weight) 1 day in air, 6 days in water. not less than 125# per sq.in. 1 day in air, 14 days in water not less than 150# per sq.in.

CHECKING

Pats made on glass of neat cement mixed with enough water for plasticity, and allowed to set, shall show no cracking or checking when immersed in water at ordinary temperature.

COLOR

The color shall be uniform throughout.

SPECIFIC GRAVITY

The specific gravity shall not be less than 3.10.

S P E C I F I C A T I O N S

FOR STEAM PIPING FOR NEW PUMPING STATION

SOUTH PITTSBURG WATER COMPANY

GENERAL

The intent of these specifications is to describe a thoroughly first class job of pipe fitting and one that will be satisfactory under 150 lbs. working pressure with a superheat of 150 degrees.

The plans must be looked upon as forming a part of these specifications and anything mentioned in one and omitted in the other or vice versa must be included by the bidder in making up his bid.

JOINTS

No wrought iron pipe herein embraced may be connected together with screwed sleeves unless special permission has been obtained from the engineer for their use and all runs of pipe shall be as far as possible without joints, but the contractor agrees to put in flange joints where necessary to complete runs of pipe whether shown on the drawings or not.

8" flanges shown on the drawings shall be either forged or rolled from the solid without welds. The 8 inch joint intended is that known as the "Atwood" or similar construction but bidders must submit design for approval, which design shall show all dimensions and details.

All flanges smaller than 8 inch are to be cast iron screwed on the pipe to the full depth of the flange and the pipe pened or expanded into threads.

Flanges of whatsoever size or dimension must conform to the Manufacturers' Heavy Standard.

All blind flanges are to be of cast iron the same thickness as flanges on similar sized cast fittings and provided with dished centers.

PIPE

Especial care must be taken with all piping in order that it may come together without putting any initial strain on the work, that is to say, the pipe and fittings must come together as a perfect fit without being pulled into place by bolts.

The main eight inch header must be of the best wrought iron lap-welded iron pipe.

The branch pipes containing curves or bends may be of mild steel should the contractor so elect.

HANGERS AND WALL BRACKETS

Plans and elevation of this pipe in place may be seen at the office of the American Water Works and Guarantee Company from which the number and location of hangers and wall brackets and details of these utilities must be submitted with their bid for approval.

Contractors will be expected to put same in place and where brackets are bolted through the walls a neat Star washer must be furnished held on by a champered nut beyond which the through bolt must not extend.

GASKETS

Gaskets throughout the work must be of such a nature as to withstand the temperature due to the pressure of 150 lbs. and in addition to this the 150 degrees superheat. Corrugated copper will be preferred.

BOLTS

All bolts for flanges, fittings and valves throughout are to be of wrought iron, made from the solid, with hexagon heads and cold punched hexagon nuts, and the under sides of heads and nuts to be faced in all cases, and the surfaces on valves, flanges and fittings are to be machined or spot faced for the bearing of bolt heads and nuts throughout the whole work.

The contractor will furnish all bolts for connecting pipe to the terminal fittings now in place.

CASTINGS

All iron castings in valves, flanges and fittings are to be of the very best mixture for the purpose, with core cast truly concentric, and to be of good surface, and core sand is to be thoroughly and carefully removed from all the interior surfaces.

DRAINAGE

The header shall be given a slight pitch toward one end in order to secure proper drainage when superheated steam is not used.

TEST

All lines and systems of piping hereinafter described will be subject to a test of One Hundred and Fifty pounds steam pressure per square inch. The lines, together with all valves, fittings, gaskets, etc., shall stand this test in a manner satisfactory to the Engineer, and should any leaks or imperfections develop in any portion of his work, the material is to be removed immediately. No valves, fittings or other material known to be faulty at time of erection or test will be accepted subject to guarantee or replacement by the contractor in case of failure at some future time.

BLOWING OUT

After the lines have been tested and proved satisfactory they shall in all cases possible be thoroughly blown out by live steam in order that any dirt or loose scale which may have accumulated during erection and testing will be discharged from the system before it is put into use.

No pipe covering or insulating material of any kinds is included in this piping contract.

VALVES

All valves in the steam piping throughout shall be extra heavy gate valves with double tapered discs and seats, outside screw and yoke preferred. They shall have cast iron bodies, bronze stems and bronze mountings. Their design shall be such that they may be packed in either position, wide open or tight shut. They must be provided with removable and renewable seats and the design must be such that such renewals may be readily effected by the ordinary mechanic without removing the body of the valve from its position in the line.

A cross section of this valve illustrating the above feature shall be submitted with the bid for the approval of the Engineer.

These valves shall be tested from each end separately and proved tight in the shop where they are made under three hundred pounds hydraulic pressure per square inch.

All valves of a given size shall be interchangeable with all other valves of the same size.

The Water Company will make all openings through brick walls for the insertion of pipe and close same.

BIDS

The bids on this work must be for same erected and tested complete at the pumping station of the South Pittsburgh Water Company in Baldwin Township near the Borough of Carrick, and must be conditioned upon the completion of this work on or before May 20th, 1906 under forfeit.

S P E C I F I C A T I O N S

FOR BREECHING FOR THE BOILER PLANT OF THE SOUTH PITTSBURG WATER COMPANY

MATERIAL

Material to be of thickness and dimensions shown on the print and bids are invited on iron with alternates on steel. A decided preference will be given the former.

WORKMANSHIP

The workmanship to be first class in every respect. The finished job to present a neat appearance, to be practically free from air leaks, be hung evenly and in the erection thereof extreme care to be taken against the marring of the interior of the building or the brick work, or other parts of the boilers to which this breeching shall be attached. The entire work to be subject at all times to the inspection and approval of the Engineer of the Water Company.

PAINTING

On completion the entire work shall be carefully cleaned or made free from any rust, grease, mill scale or other foreign accretions, either by the use of a wire brush and painters duster or other appropriate means, and shall be given, both inside and out, two (2) coats of graphite paint of a brand to be selected by the Water Company.

RIVETING

All riveting shall be neatly done. Where spacing is not indicated on the drawing, standard spacing for such work shall be employed, all rivets to be of a size in keeping with the thickness of the plates. All exterior rivet heads shall be finished with button set.

BIDS

Bids submitted must be for the furnishing of all material and labor, including hauling and erection complete ready for service, as outlined above, and it is the intention of this specification to cover a complete job and bidders are cautioned against the omission of any item necessary to make up same.

DELIVERY

It is expected to have the boilers ready for the reception of this breeching between the middle and last of February. The Water Company, however, is dependent upon the boiler contractor, and the bidders on this breeching are cautioned that they, in their delivery and erection, must be governed accordingly. This work, however, will be expected to begin as soon as the boilers are ready for its reception and completed within thirty days from the date of notice given by the Water Company that the boilers are ready for the reception of the breeching.

Bidders are requested to visit this pumping station and inquire for themselves such information as may be necessary in regard to the hauling, the condition of the material for its entrance into the building and erection therein.

GENERAL SPECIFICATIONS

FOR ELECTRIC LIGHTING OF PUMP STATION AND FILTER PLANT OF SOUTH PITTSBURG WATER COMPANY

GENERAL

Bidders are requested to visit the plant to examine conditions and to work out and specify in detail the manner in which they would accomplish the results called for in these general specifications.

Where light is mentioned in these specifications it shall be construed to mean a 16 candle power incandescent unless otherwise stated.

We expect durable, lasting fixtures in every case. A great deal of cost must not be incurred to provide a fancy appearance, preferring plain, simple but still presentable fixtures.

All bids to be for work complete and anything necessary to make with what the bidder will find on his visit there a complete lighting plant in every detail must be construed as being included in these specifications.

COAL HOUSE

Place in first story of coal house well up near the second floor, four side lights which shall be controlled from a switch at the door entering from the boiler room.

Place upstairs in coal house three lights suspended from above, and a bracket light outside from the door over the elevator, all of which shall be controlled by a switch at the elevator door.

Lights downstairs are indicated in drawing enclosed by red crosses, upstairs by red circle.

SHOP

The shop is immediately beneath the forward end of the boiler room, and the location of lights are indicated by circle.

Place one light in the toilet and one beneath the stairs, to be controlled by a switch in the boiler room at head of stairs. Place four additional drop lights as shown, to be controlled by switch at the foot of the stairs in the shop.

BOILER ROOM

Place one drop light in front and one in rear of each boiler as shown, one in center of space left for new boilers, one near heater, one from feed pump, and one that may be brought close to the dial of the scales when weighing coal. Let these be controlled by a switch near door leading into engine room.

ENGINE ROOM

Place four arc lights approximately as shown by red circles on drawing, each arc light to be controlled by independent switch.

PUMP ROOM BASEMENT

Place five lights as shown by red cross on drawing which lights shall be dropped from the ceiling or floor above and controlled by switch at foot of stairs. Place between each engine a socket and from this socket lead a cord which will suspend the drop light in the vicinity of the air pump of each pump and provide sockets for the two additional pumps.

ELECTRIC LIGHT ROOM

Provide switchboard and necessary instruments for the plant. Specify make and size of each instrument, material used in switchboard, etc.

STORE ROOM

Place one side light as shown and provide with cord sufficiently long to reach any part of the room.

TOILET

Place one light as shown.

FILTER HOUSE

Machinery room, place a cluster of four lights with reflector, on ceiling in middle of room. Place one drop light over centrifugal pump, one over wash pump, and one over air compressor. Provide a switch for turning on and off cluster.

Second floor, place four side lights around room, and one drop light in center of room.

TOILET

Place one side light.

OFFICE

Place one drop light and one side light as shown by crosses.

ENTRY HALL

Place two drop lights.

FILTER OPERATING ROOM

Place seven drop lights along center of room, which shall be controlled from a switch at the door leading from the machinery room.

Provide a light in the forward end of each filter, if possible with a reflector, so arranged that light may be raised and lowered through a range of 24 inches, each of these last lights to be controlled by separate drop button switch.

Furnish four extension drops that may attach to any light in the middle of the room, and that will reach to the bottom of the pipe gallery.

COAGULANT HOUSE

Place four side lights and three drop lights as shown by red cross, side lights to be controlled from switch at basement door.

OUTSIDE LIGHTS

Place one light outside and in front of upper story of filter house, one outside and in front of coagulant house, both to be controlled by switch at door of filter house. Place one light at corner of filter house near settling basins. Place one light in front of engine room near center, controlled by switch at engine room door. Place one light in front of boiler room controlled by switch at boiler room door.

AERATORS

Give extra price for a suitable crane for suspending and arc light for same, to be erected at the upper end of the settling basins near the aerating pipes, including connecting up of same, to be controlled by switch within the filter house.

NOTE

All work to be done in accord with the Board of Underwriters requirements as well as the requirements of and subject to the inspection of the Bureau of Electricity of the City of Pittsburg.

S P E C I F I C A T I O N S

FOR PUMPING STATION AND FILTER BUILDING FOR

SOUTH PITTSBURG WATER COMPANY

GENERAL INSTRUCTIONS

The drawings and these specifications are intended to embrace all labor and material required for the completion of the pumping station and filter building on the grounds of the South Pittsburg Water Company located near the intersection of Agnew Avenue and Becks Run Road in Baldwin Township and will be taken as co-operating with and explaining each other and anything shown on drawings and not mentioned in the specifications, or vice versa, will be included the same as if specified and shown and in addition anything which may be clearly implied as necessary to the work and the proper completion of the building will be furnished by the contractor whether directly mentioned or not. On all drawings, figures in every case will take precedence over scale dimensions and large scale drawings over small. All materials to be of the best of their several kinds and all workmanship to be of the highest grade. Material and workmanship will be subject to the approval of the Engineer of the Water Company, or his authorized agent, and his decision will be final and binding in all cases. The Water Company reserves the right to make any alterations or changes in the plans and these specifications without affecting the validity of the contract and should changes involve a difference in cost, the amount thereof shall be either added or deducted from the contract price as the case may be, and no extra work involving additional cost shall be started by the contractor without first having received a written order for the same from the Engineer of the Water Company. No such changes, extras, or deductions shall in any way invalidate the contractor's bond or extend the time for enclosing or completing building unless so stipulated. No bills for extra work will be accepted without an order as above mentioned. All official building laws and ordinances are to be considered as part of these specifications and therefore complied with. The contractor will obtain and pay for all necessary permits and licenses, etc., in connection with this work. The contractor will provide all necessary material

labor, scaffolding, centering, tools, etc., and everything required for the full completion of this work according to the plans and these specifications either embraced or implied, and after completion shall remove all debris and waste lumber and leave buildings and grounds in as good condition as he found them. The contractor will be held to bear the expense of all damage to the existing work resulting from the work of the new buildings. The bidders are required to examine site and present foundations as no allowance will be made for lack of knowledge of the premises.

PUMP HOUSE SPECIFICATIONS

FOUNDATIONS

The foundations up to the bottom of the water table will be put in by the Water Company. On that portion of the side wall of the pump house which rests on the filter wall, the concrete work will be put in by the Water Company up to the bottom of the window-sills.

STONE WORK

All stone work shall be of Bedford limestone of a uniform color. All exposed surfaces of stone shall be rubbed smooth and be free from all tool or rust marks. The belt course or water table is to be of stone 14" thick with 8" bed with a 1½" chamfer cut at the top. Stone sills 5" thick with 8" bed and cut with wash and drip projections shall be placed under all windows as shown on plan. Stone lintels about 12" deep and extending the full thickness of the wall shall be placed over lower row of windows as shown on plan. On the interior of the pump and light machine rooms the stone lintels shall be cut with a rounded corner of 2" radius as shown on the detailed plan. Stone lintels about 14½" thick and extending the full thickness of the wall are to be placed over the three large doors as shown on the plan. All lintels over windows shall have an 8" bearing on the brick work on each side of the opening. All lintels over the three large doors shall extend from pilaster to pilaster as shown. Stone lintels 12" wide and extending the full thickness of the wall shall be placed over the two doors in the end of coal-house. Stone lintels 18" thick with 8" beds are to be placed over all windows and door in basement of boiler room as shown. A 6" stone coping is to be placed on top of the area-way which leads into the basement of boiler room. Both edges of same to be chamfered 1½". A 6" stone coping to conform to other exposed stone surfaces is to be placed on top of all brick walls as shown

on plans. That part of the coping on which the sill of the ventilator rests shall be cut with a wash as shown. No coping or water table stone unless enclosure or dimension stone shall be less than four feet in length. All sills and lintels shall be only approximately the dimensions specified and shall be required to properly join with the brick work. All stone work shall be laid on a natural bed and set level and to a perfectly true horizontal line.

BRICK WORK

All exterior surfaces of walls to be faced with buff Fallston front brick, as per sample "J" submitted by the Pope Cement & Brick Company, to cost $16.50 per thousand, F.O.B. Becks Run Station. All interior surfaces of wall, except coal house, to be faced with Buff Fallston front brick, as per sample "B" submitted by the Pope Cement & Brick Company, to cost $16.50 per thousand, F.O.B. Becks Run Station. All other brick in walls to be hard burned common brick from which all salmon-colored or soft brick will be discarded and no empty spaces or voids will be allowed in the wall. All face work shall bebonded to the backing every seventh course by a chipped or diagonal secret bond or blind header. All buff faced brick shall be laid with full butter joints, struck and trimmed. Vertical and horizontal joints shall not be over 3/16 of an inch thick. Horizontal joints shall be laid to line and perfectly level. Vertical joints shall be perfectly plumb and all work shall be true and even at the intersection of stone walls and lintels.

Mortar for all interior of walls shall be composed of one part Portland cement and four parts Allegheny River sand, free from coal, tempered with one part of lime to eight parts of cement mortar. Mortar for the exterior courses or butter joints shall be of mortar composed of white rock sand and clear well slaked lime and tempered with sufficient Portland cement to give it a perfectly hard and practically impervious surface when thoroughly set.

An air space of 3/4 of an inch is to be left between the concrete wall on the east side of the pump house and the 4" veneer wall. At intervals of about 2 feet, in every eighth course of brick, a blind header is to be cut of such lengths that it will butt against the concrete wall. In the bottom course of brick, weep holes are to be formed at about 4 feet intervals by omitting the mortar between the ends of the two bricks. Care must be taken to prevent mortar or other foreign substance getting between the brick veneer wall and the concrete backing as this

space must be free for the passage of water. All brick must be wet before laid. All arches over openings must be neatly turned and built on suitable wood centers. Steel columns for supporting crane run-way are to be furnished by the Water Company and placed in position as shown on the blue prints, by the contractor, before the brick walls are started and the brick work is to be built around the anchor bolts projecting into it from these columns.

The contractor will furnish and place in walls, all necessary wood brick and subsills, all to be well seasoned lumber, all wood brick to be of the thickness of a brick and two joints of mortar. At the completion of the building all mortar and other stains shall be removed from both faces of all walls.

All window openings in pump and light machine rooms, arched openings to light room and doors to lavatory and store room are to be trimmed with brick having nose rounded to 2" radius and of same quality and color as interior wall.

Moulded brick of design selected, shall be placed on top of all pilasters; these brick to be of the same shade as the outside brick work.

COAL HOUSE

The interior of the coal house is to be laid up in ordinary hard burned red brick laid in line with joints neatly struck. The lower floor of the coal house shall be paved with hard burned, evenly formed, vitrified paving brick, laid on a cinder-fill of not less than 6" in depth, which shall be thoroughly rammed and leveled off with not less than 1" of screened cinders or building sand. Earth sub-fill for this floor will be made by the Water Company. After the brick are laid, they shall be thoroughly grouted in with Portland Cement. Grouting must be one part sand and one part cement and at the time of grouting, sufficient mortar must be poured over the floor and troweled off to furnish an even surface for shovelling. The contractor will lay coal track, to be furnished by the Water Company, as shown on the plan and directed by the Engineer.

CARPENTER AND MILL WORK

PUMP HOUSE FLOOR

The contractor is to furnish amd put in place the long 4 x 12" joists between the wall between the pump and boiler houses and the east wall of the sump in the pump room. These joists to

be of yellow pine surfaced four sides. All headers and trimmers around openings for stairs to be double and securely spiked together Joists to be cross bridged at intervals not to exceed 6 ft. with 1 x 3 bridging securely nailed to joists at top and bottom. All other joists and beams shown in pump room to be omitted from this contract. Headers to be hung to trimmers with 3" x 5/8" iron stirrups. Tail beams to be hung to header with 2" x 1/2" iron stirrups. The contractor is to provide and put in place carriages for supporting the stairs from the top floor of the pump house to basement and shall nail temporary treads to these carriages. The contractor shall also lay over the pump room floor sufficient planks to enable the workmen to get around safely. These planks will be furnished by the Water Company to the contractor free of charge. All other floors in pump room shown on drawing to be omitted from this contract.

NAILING STRIPS

Nailing strips for roof sheathing in pump and boiler rooms to be 2 x 6 yellow pine surfaced four sides and to be securely bolted to channel purlins as shown on drawing.

ROOF SHEATHING

The whole roof of pump house, boiler house and coal house, including roof of ventilator, shall be covered with 1½" yellow pine, tongue and grooved, headed sheathing not over 2½" in width, to be driven up close and secret nailed at every bearing.

VENTILATOR

The ventilator is to be made of design shown on drawings. The sides of ventilator are to be sheathed on the outside with 3/4" white pine, tongue and grooved sheathing and on the inside with 3/4" yellow pine, tongue and grooved beaded sheathing not over 2½" in width, to be driven up close and secret nailed to the 2 x 4 studding.

PARTITIONS

Build wooden partitions to a height of 8 feet above the floor between lavatory and store-room and between store-room and electric light room as shown on drawing. Studding for partition to be 2 x 4 hemlock, space 16" center to center, to

be secured at the bottom to a 4 x 4 sleeper imbedded in the concrete floor. Partitions to be covered on both sides with 3/4" yellow pine, tongue and grooved, beaded sheathing not over 2-1/2" in width. The partitions will be finished off at the top by a moulded cap piece.

RAFTERS

Rafters for coal house to be 2 x 10 yellow pine surfaced four sides, spaced 24" center to center. Rafters to rest on wall plates, which are to be securely bolted into the brick work with 5/8" bolts 24" long, space not less than 5 feet center to center.

COAL HOUSE FLOORS, ETC.

The upper floor of the coal house is to be built as shown on drawing. Stringers and joists to be of yellow pine. Flooring to be 3 x 12 oak planks securely nailed to stringers and joists. The contractor is to furnish and put in place 10 x 10 yellow pine beams, surfaced four sides for supporting the levers which are to be used for dumping coal cars. Also provide trap doors where shown. Trap doors to be built of 1-1/4" flooring to be hinged and provided with counter-sunk rings for lifting. The contractor shall also provide and put in place in coal house all levers with all necessary hooks, rods and chains complete as shown on drawings.

BOILER HOUSE BASEMENT

Provide 3 x 3 beveled sleepers and imbed in concrete floor of the basement in the boiler house. Sleepers to be of yellow pine, spaced 24" center to center to be thoroughly coated with tar before imbedding. Cover the entire floor of the basement with 1" yellow pine flooring not over 4" in width. One corner of the basement is to be partitioned off for a lavatory as shown on drawing. Studding for partition to be of 2 x 4 hemlock, except posts which come under corner of short eye-beams which are to be of 4 x 6 yellow pine. The partition to be covered on both sides with 3/4" tongue and grooved sheathing driven up close and secret nailed. Door to be made of 3/4" sheathing to match partition. Before laying the floor of the basement the entire concrete floor is to be thoroughly coated with tar.

WINDOWS AND DOORS

All the lower row of windows in both the pump and boiler rooms to consist of two sets of double hung windows. Sash to be of white pine 1-7/8" thick. Frames to be box frames with groove

mullions and moulded outside. Frames to be of 1-1/8" white pine rebated together and shall have 1-1/8" yellow pine pulley styles. To have parting beads and shall be constructed to receive pulleys, weights, etc. Frames are to be built as per detail furnished. All other window frames in pump, boiler and coal houses to be solid white pine frames 2" thick rebated for sash with outside moulding, to be built as per detail furnished. Sash to be of white pine 1-7/8" thick. The center windows of upper row in pump, boiler and coal houses are to be pivoted. Frames in basement of boiler house to be furnished and put in place by the Water Company. The outside moulding of frames to be furnished by the Water Company and put in place by the contractor. Windows in basement of boiler house are to be finished on the inside with 7/8" x 5" moulded trim mitred at the corners. They are to be provided with moulded stools and aprons of yellow pine. The ventilator sash to be of white pine 1-7/8" thick. All ventilator sash to be pivoted. Frames to be built of 2" white pine. Sills and head pieces to be of 2 x 6 white pine. Sills to be cut with wash as shown. The small windows in the coal house which are located directly under the upper floor are to have white pine frames moulded on the outside. These windows are to be arranged to open by sliding sideways in the grooves which are to be formed by placing two 4 x 6 wood bricks in the masonry projecting on the inner side 2-1/2", to which must be nailed match flooring in such a way as to form a pocket into which the frame may slide and which will protect the glass from being broken by the coal. All windows are to have the number of lights indicated on the elevation drawings.

All outside door frames to be of white pine 2" thick rebated for door with moulding outside and to be made according to detail furnished. All outside doors in pump and boiler rooms to be of white pine 2-1/4" thick veneered on the inside with yellow pine. They shall be panelled as shown on elevation drawing. They shall have glass in upper portion divided by the moulded muntins. A small panelled door shall be framed in the center of each outside doorway and shall be hinged to one of the larger doors. Doors in the end of coal house and boiler house basement shall be of white pine 2" thick, panelled as shown on drawings.

Frames to be of white pine moulded on outside and rebated for door. A sliding door 1-3/4" thick and covered with sheet iron of number 18 gauge shall be placed between the boiler and coal houses. All other interior doors in pump station to be 1-5/8" thick yellow pine with five panels each. All interior door frames to be of yellow pine moulded on both sides as per detail furnished.

MATERIALS

All exterior finish, unless otherwise specified, shall be of strictly first class quality of thoroughly seasoned white pine, perfectly free from knots and pitchy places. All interior finish shall be of perfectly sound thoroughly kiln-dried yellow pine, free from large or loose knots, windshakes or other imperfections which would weaken or injure the appearance of the work. All hemlock for studding to be number one free from all large or loose knots which would tend to weaken it.

STRUCTURAL STEEL & IRON WORK

Trusses and purlins to be of design shown on detailed drawings. Trusses are to be securely anchored on one side into the brick wall; on the other side they are to be provided with sliding plates which are to be planed. The lower plate to be anchored into the brick wall. The steel used in this work shall have a tensile strength of from 54 to 62,000 pounds per square inch and an elastic limit of not less than one-half of the ultimate strength. All rivets shall be made of soft steel and driven hot so that they will completely fill the rivet holes. All rivets to be 3/4" in diameter and rivet holes 13/16" in diameter, unless otherwise shown on plans. As much of the truss as possible shall be shop riveted. Bolts may be used instead of rivets for field work. Bolts to have hexagonal heads and nuts. In boiler house basement eye beams for supporting the floor to be provided and put in place as shown on the drawings. Eye beams to be of sizes and dimensions shown. Eye beams are to be connected to each other where shown with standard angle clips. A 9x12x3/4" bearing plate is to be placed under the end of each eye beam that rests on the masonry. Eye beams are to be stayed with 7/8" tie rods as shown on drawings. The contractor will furnish and put in place in coal house eye beams of sizes shown for supporting the joists and stringers. The ends of the eye beams are to rest on 9x12x3/4" bearing plates. The walls of the coal house are to be tied together with 1-1/4" tie rods extending clear through the masonry at the height shown and terminating on the outside of the walls with cast iron star washers. The contractor shall furnish and put in place cast iron door sills with roughened checkered treads under all outside doors of boiler and pump rooms, the door sills to be at least 4" longer than the width of the opening and to extend the full depth of the wall. Provide and put in place cast iron gratings in coal house as shown. Provide and put in place iron stairs from boiler house floor to basement. Stringers to be of channel irons or of cast iron secured at the top to the

eye beam and at the bottom to the concrete floor. Rivet or bolt 2 x 2-1/2 x 1/4 angles to flange of eye beams all around stair opening with the 2" leg vertical to form a protection for the edge of concrete floor. Provide and place over the top of each interior door opening two 4 x 4 x 3/8" angles.

CONCRETE WORK

All concrete used in this work shall be mixed in the following proportions: one part of Atlas or Alma Portland Cement, two parts clean sharp river sand and four parts of broken stone. The broken stone for the concrete work will be furnished to the contractor by the Water Company free of charge. The concrete shall be laid in layers of not over 8" in thickness and thoroughly tamped with heavy tamping boards until moisture appears on the surface. Concrete will be used wet whenever practicable and dry only when the nature of the work requiring its use is unavoidable. The mixing and placing of the concrete must be done in a manner which will be approved by the Engineer of the Water Company or his authorized agent.

CONCRETE FLOOR IN BASEMENT

The entire basement floor in the boiler room shall be covered with 6" of concrete with 3x3 sleepers imbedded in the upper surface. The bottom of the area shall be covered with 6" of concrete which shall be sloped towards the drain and shall be finished off with a coating of mortar troweled on.

The contractor will put in concrete floor over basement to the top of the eye beams only. The concrete shall be built on suitable centers held firmly in place.

Floors of pump house lavatory and store room to be made of 6" of concrete finished off with a coating of cement mortar troweled on the surface of the concrete before it has thoroughly set. The floor of shower bath is to set down 6" below the floor line and is to be made sloping towards the drain. The corner of the step is to be rounded. All sub-fill for these floors will be put in by the Water Company.

ROOFING & FLASHING

Pump house and boiler house, including roof of ventilator together with roof of coal house, shall be covered with Ehret's Standard four ply slag roofing, to be furnished and applied by the Warren Ehret Company of Pittsburg, and guaranteed by them for a period of ten years. Gutters on the side walls are to be formed by laying tongued and grooved sheathing at an angle with the roof,

securely nailed at one end to 4x4 strip imbedded in the wall and at the other end of the roof sheathing. The roofing is to be brought over the gutter and firmly secured at the top to a 4x4 strip. At the intersection of the end walls of the building and with the main roof and ventilator roof the roofing is to be turned up against the wall at least 12" on the lower side and 5" on the upper side and securely fastened to a 2 x 4 strip built in the brick work.

FLASHING

The intersection of all roofing with brick walls is to be counter flashed with copper flashing. The intersection of the end of the ventilator with the end walls of the building is to be flashed with copper. Flash with copper the end intersection of the ventilators with the main roof. The intersection of the sill of ventilator or that part of it that rests on top of the stone coping of the brick wall shall be flashed with copper as shown in detail on the drawings.

The openings made for all down spouts shall be thoroughly flashed with copper. All copper for the above work shall weigh not less than sixteen ounces per square foot.

DOWN SPOUTS

The contractor shall provide and put in place at the proper time 4" square copper down spouts, as indicated on the drawing, or as may be directed by the Engineer in charge. The conductor from the roof shall terminate on the outside of the brick wall with an ornamental head, the design of which is to be approved by the Engineer of the Water Company, and to be made of copper. All down spouts shall terminate at a height of four feet above the bottom of the water table in a square cast iron spout. All the down spouts which are not directly over the roof of the filter shall be connected to the sewer line by 4" cast iron pipe as shown on the drawings.

The down spouts which are directly over the roof of the filters shall be curved at the bottom and discharge directly onto the filter roof. All copper shall be 16 oz. to the sq.ft.

HARDWARE

The windows of ventilators are to be operated with Hitching & Company's ventilating apparatus, or its equivalent, if approved by the Engineer of the Water Company. Use 1-3/8" extra heavy shafting, 7/8" steel worm rods, extra heavy arms, mitre gear,

rods, Universal joint and worm gear to make a complete job. Operate the roof ventilator in two sections on each side, one of twelve sash and one of fourteen sash, to each fixture. Use two rods and arms to each sash. Pivot sash with No. 35 Reading sash pivot. The middle sash in top transom in the end walls of pump room are to be pivoted and operated with Hitching & Company's device, as are also the middle sash of the top transoms in the side and end walls of boiler house. All the above described apparatus is to be furnished and put in place by the contractor. The plans for same to be first approved by the Engineer of the Water Company. The contractor will furnish and put in place a Coburn door hanger with all necessary stops, bolts, etc. All other finishing hardware than that specified above shall be furnished by the Water Company and put in place by the Constractor. All other rough hardware shall be furnished and put in place by the Contractor.

SOIL LINES AND WASTE

A 4" cast iron soil pipe is to be run from the sewer at the point indicated on the drawing to each of the two lavatories and from there up through the roof with all necessary sanitary branches. All fixtures to be back vented and connected to soil lines. A 4" cast iron pipe from areaway is to connect to the sewer as indicated on the drawings. All soil lines and vents that pass through the roof are to be flashed with lead at the intersection with the roof, said flashing to weigh not less than four pounds. All joints in cast iron pipes shall be thoroughly caulked with oakum, run with lead and set down with a tool. Furnish area way with cast iron grating and trap. All work to be done in first class manner and in strict accord with the plumbing rules of the City of Pittsburg.

WATER PIPES

Lay 3/4" extra strong galvanized pipe except where brass is shown on drawing, for both hot and cold water from point indicated on drawings, to each of the two lavatories with 1/2" connections to each fixture. All exposed pipes, with the exception of the piping in the lavatory in the boiler house basement, is to be brass nickel plated. Place brass stop cock on each of the supply mains to both lavatories at the point indicated, or as may be directed. Grade all pipes so that they will drain perfectly dry either at the fixture or at the stop cock.

SINKS

Furnish and set in each lavatory a 20 x 24 iron sink,

enameled inside and out, and at least 6" deep. Sink to have enameled rooled rim back at least 12" high; to be supported on nickel plated legs or brackets, and to be supplied with hot and cold water. The supply pipes in the pump house lavatory to be 1/2" nickel plated brass with nickel plated compression cocks, closing with pressure; with nickel plated floor or wall flanges at the intersection of the pipes with the floor or wall. Trap and waste above the floor to be nickel plated; to be supplied with nickel plated strainer, plug and chain. The sink in the basement lavatory is to be supplied with hot and cold water through 1/2" galvanized iron pipes with brass compression cocks and waste through 1-1/2" lead trap and pipe; to be supplied with nickel plated brass strainer, plug and chain.

WATER CLOSETS

Furnish and set in each of the two lavatories one water closet. Each tank shall be lined with 12 oz. Copper. Wood casing of tank, seat and lid shall be of finished oak and shall be equal to the Ft.P.Supply Company's "Rubico" Plate 1229, syphon jet, low down tank of their catalogue or its equivalent, if approved by the Engineer. Supply pipe in pump house lavatory to be 1/2" nickel plated brass. Supply pipe for closet in basement lavatory shall be 1/2" galvanized iron extra heavy.

SHOWER BATH

Furnish and set in place in pump room lavatory one nickel plated brass shower with supply pipe to floor. Compression cock to be placed on both hot and cold supply. All piping and fittings to be of nickel plated brass. The waste to be 2" heavy lead vented trap and shall have nickel plated brass strainer to same. The shower shall be equal in all respects to the Fort Pitt Supply Company's Fort Pitt plain shower, Plate 1094, of their catalogue. Three sides to be wainscoted with 1-1/4" slate to a height of 7' with nickel plated angles and bolts.

PAINTING

All outside woodwork shall receive one priming coat as soon as in place, and all the window frames, except portions which are to be finished natural color, as soon as they have been inspected. All the knots and pitchy places shall be thoroughly shellaced before the first coat is put on and after the first coat has been placed, all nail holes shall be putty stopped. All out side wood work shall finally receive three coats of paint made of pure linseed oil and white lead, of a color to be selected by

the Engineer of the Water Company. The interior wood work in pump house, boiler house, store room, lavatories and electric light room shall be finished in natural colors with one coat of filler and three coats of hard oil finish. All woodwork in the interior of the coal house, with the exception of the floor joists, shall receive one priming coat and two coats of paint made of pure linseed oil and white lead, of a color to be selected by the Engineer of the Water Company. All iron work in trusses, crane columns and crane girders, and all other iron work, both inside and out, shall be thoroughly cleaned of all rust, grease, mud and dirt and shall be then thoroughly and evenly painted with two coats of the best grade of graphite or carbon thoroughly mixed with and ground with pure linseed oil.

GLAZING

All glass used in this work is to be AADS American window glass. All glass to be back puttied and bradded in and shall be left whole at the completion of the building. Window of basement toilet room shall be provided with an approved ground glass.

The above building shall be enclosed within sixty days from the signing of this contract, and shall be completed within ninety days from the signing of this contract.

FILTER HOUSE SPECIFICATIONS

FOUNDATIONS

The foundations of the filter building up to the bottom of the water table will be put in place by the Water Company. The concrete foundations for that portion of the filter building which is built over the filters will be put in place by the Water Company up to the top of the 6" coping shown on the drawings.

STONE WORK

All stone work is to be the same as specified under heading "Stone Work" in pumping station specifications. A water table 14" deep with 8" bed is to be placed around three sides of the higher portion of the filter building as shown on the filter building drawings. All sills to be of cut stone 5" thick with 8" bed cut with wash and drip projections. A 6" stone coping is to be placed on the top of all brick walls shown. All sills shall be only approximately of the heights indicated and shall be required to properly join with the brick work.

All stone work shall be set level on natural bed to a perfectly true horizontal line. Stone sill under door to extend

full width of wall.

BRICK WORK

All exterior surfaces of walls of filter building and all interior surfaces of walls, with the exception of the second story of the higher portion, shall be faced with the same brick as specified for the interior and exterior of the pump and boiler house, in the specifications for the same under the heading "Brick Work"; all other brick in walls to be of hard burned common brick of approximately the same size as the face brick, so that the walls may be properly bonded. All salmon colored or soft brick will be discarded and no empty spaces or voids will be allowed in the walls. All exterior and interior face brick shall be bonded in the backing every seventh course by a chipped or diagonal secret bond. All Fallston face brick shall be laid in stretchers only. The interior face brick in the walls of the second story shall be laid with ordinary English bond, every seventh course, a header. All brick must be wet before laying in the wall. All buff face brick joints shall be laid as perspecifications for pump and boiler house. The mortar shall also conform to these specifications. The second story of the higher portion of the filter building is to be finished on the inside as above stated, with common red brick, struck joints, and enough wood grounds are to be built in all exterior walls of the second story, to afford nailing for one by two furring strips, space 16" center to center.

CARPENTER AND MILLWORK

FRAMING

All floor joists on first floor to be 2 x 12 yellow pine surfaced four sides, spaced 12", center to center. All floor joists on second floor to be 3 x 10 hemlock, spaced 12" center to center. All trimmers and headers around stair openings and gallery to be doubled. All headers shall be hung to trimmers in 3" x 5/8" iron stirrups. All joists shall be cross bridged with one inch by three inch strips at intervals of six feet. Under all unsupported stud partitions running parallel with the floor joists, the contractor shall place two regular joists. All partitions shown shall be built of 2x4 hemlock studding spaced 16" center to center. Partitions crossing floor beams shall rest on 4x4 plates. Studding at all corners and door openings to be doubled.

RAFTERS

All roof rafters over two story portion of filter building to be 2x8 hemlock, spaced 16", center to center. Wall

plate on which rafters rest to be bolted into brick work with 3/4" anchor bolts 18" long, spaced 5' center to center. Ceiling joists to be 2x6 hemlock, spaced 16" center to center. Hip rafters are to be doubled.

NAILING STRIPS

2x8 yellow pine nailing strips, surfaced four sides, are to be bolted to all channel purlins over the roof in lower portion of filter building.

ROOFING

The entire roof of lower portion of building is to be covered with 1-1/4" yellow pine tongue and grooved beaded sheathing, secret nailed at every bearing. If sheathing is over 4" wide, it is to be beaded down the center. The roof over the two story portion of the building is to be covered with sound hemlock boarding, surfaced one side to a uniform thickness, of 7/8 of an inch. Roofing shall be curved to form eye-brow opening and no sudden break must appear in the roof.

FLOORING

The entire first and second stories in the two story portion of the building shall have a double floor. The under floors are to be 7/8" surfaced hemlock boards, laid diagonally, driven up close and securely nailed to every joist. The upper floor in first story shall be of 7/8" x 2-1/2" rift sawed yellow pine. The upper floor in second story shall be of 7/8 x 2-1/2" yellow pine flooring. Flooring around gallery to have rounded nosing with moulding on under side.

CEILING

The entire first and second story ceilings are to be covered with 3/4" tongue and grooved yellow pine beaded ceiling not over 2-1/2" wide. The outer walls of the private office, laboratory, lavatory and closet are to be furred with 1x2 furring strips, spaced 16" center to center. Both sides of all partitions and the outer walls of all of the above mentioned walls are to be covered with 3/4" tongue and grooved yellow pine, beaded sheathing, not over 2-1/2" wide.

WINDOWS

All windows to be double hung windows. Sash to be of white pine 1-3/4" thick. Frames to be box frames with moulding on outside. Frames to be of 1-1/8" white pine rebated together and

shall have 1-1/8" yellow pine pulley styles and parting beads, and these frames shall be provided with pulleys, weights, etc. All windows shall have a 7/8 x 5" moulded trim, a 7/8 x 4" moulded apron and a 1-1/8" moulded stool on the inside, all of yellow pine.

DOORS AND FRAMES

Outside doors to be of white pine veneered on inside with yellow pine, to be 2" thick with transom over the top and panelled as shown on elevation. Inside doors to be 1-3/8" thick, of yellow pine, with five panels in each door. Outside door frames to be 1-3/4" thick, of white pine. The frames for doors in stud walls to be 1-3/8" thick, of yellow pine. All frames to be rebated as required. All doors and arch between the two portions of building shall be finished with a 7/8 x 5" moulded trim.

BASE

All rooms specified as ceiled in second story shall have a plain 7/8 x 8" moulded base with quarter round at intersection with the floor. The intersection of all floors and wall and all ceilings and walls in two story portion to have a quarter round.

BENCHES AND SHELVES

Furnish and erect all benches and shelves shown or as may be directed, all to be of yellow pine.

STAIRS

Construct the stairway from first floor to basement and from first floor to second floor as shown. Same to be supported by 2" carriages. These stairs will have moulded yellow pine strings and 1-1/8" yellow pine treads, with rounded nosings. Sheet the under side of stairs with 3/4" beaded yellow pine sheathing not over 2-1/2" wide. Risers to be of 7/8 " yellow pine.

RAILING

Provide and erect galvanized iron railing around gallery, stair openings and stairs. Railing to be 2" galvanized pipe and posts to be of 2-1/2" galvanized pipe, secured at the bottom by means of pipe flanges.

MATERIALS

All exterior finish, unless otherwise specified shall be

of strictly first class quality, thoroughly seasoned, white pine, free from large or loose knots, wind shakes and pitchy places. All interior finish, not otherwise specified, shall be of strictly first class yellow pine, free from all large or loose knots, shakes and other imperfections which would weaken or injure the appearance of the work. All hemlock shall be free of large, loose knots or imperfections which tend to weaken it.

STRUCTURAL STEEL WORK

Roof trusses over the lower portion of the filter building to be made according to drawings. All rivets to be 3/4" in diameter. All rivet holes to be 13/16" in diameter. The rivets shall be made of soft steel and driven hot so that they will completely fill the rivet holes. All steel used in the trusses shall have a tensile strength of fifty-four to sixty-two thousand pounds per square inch and elastic limit of not less than one-half of the ultimate strength. As much of the trusses as possible shall be shop riveted. Bolts may be used for rivets in field work. Nut heads and bolts to be hexagonal. Trusses to be securely bolted into the brick work at both ends with anchor bolts of size shown on blue print.

ROOF

SLATE

The entire roof of filter building shall be covered with No. 1 Bangor slate 10 x 20" with 3" lap and securely nailed with copper nails not less than 1-1/4" long. All slate shall be underlaid with heavy roofing paper and shall be leftwhole and in perfect condition on completion. Broken or cracked slate wil will not be allowed or accepted.

VENTILATORS

Provide and put in place at points indicated on the drawings three 18" copper ventilators of design approved by the Engineer of the Water Company.

FLASHING AND DOWN SPOUTS

The intersection of all roofs with all brick walls shall be flashed with copper flashing to a height of at least 12", forming a gutter around the entire building counter flash all gutters. The intersection of all roofs shall have suitable copper ridge rolls with wood center. All copper used for this work to weigh not less than 16 ounces per square foot.

Provide and put in place 4" square copper down-spouts at locations indicated on drawings or as may be directed by the Engineer. The 4" conductor from the gutter shall terminate on the outside of the wall with an ornamental conductor-head of design to be approved by the Engineer. Conductors to terminate 4' above the bottom of the water table in a cast iron down-spout 4" square. The two down-spouts on the north side of the filter building shall connect to the sewer with 4" cast iron pipe, into Y's left in the sewer for that purpose. The down-spouts which are directly over the roof of the filters shall terminate at a height of 4' above the filter roof in cast iron down-spouts and shall discharge directly on to the roof. The cast iron portion of the down-spout is to be cast with 90 degree bend at the bottom and also with all necessary bends or offsets to clear the projections in the brick wall.

HARDWARE

All finished hardware shall be furnished by the Water Company and put in place by the contractor. All other hardware shall be furnished and put in place by the contractor.

PLUMBING

All plumbing is to be done in strict accordance to the Pittsburg Ordinance covering plumbing.

SOIL LINE AND WASTE

Run 4" cast iron soil line from sewer to lavatory on second floor of filter building and from thence through the roof with all necessary sanitary branches. All fixtures to be back vented and connected to soil lines. All joints of cast iron pipe shall be thoroughly caulked with oakum run with lead and set down with a tool. All soil lines and vents passing through the roof to be flashed with lead at the intersection of the roof. Lead flashing shall weigh not less than 4 pounds per foot.

WATER PIPES

Run 3/4" extra strong galvanized iron pipe for both hot and cold water, from points indicated on drawing to lavatory in second floor with 1/2" connection to each fixture in lavatory and to the sink in laboratory. All exposed pipes will be brass nickel plated. Place stop cock on each riser in basement. Care

must be taken to grade all pipes so that they will drain perfectly dry at stop cock.

SINK

Furnish and set in laboratory one 24" x 30" enameled iron sink at least 6" deep. Sink to have rolled edges and to be enameled inside and out; to have enameled rolled rim back at least 12" high; to be supported on nickel plated bracket firmly secured to the wall; to be supplied with hot and cold water through 1/2" nickel plated brass pipe with 1/2" compression cocks, to be supplied with nickel plated brass strainer plug and chain. Trap and waste above floor to be brass nickel plated.

WATER CLOSET

Furnish and set in lavatory one syphon jet low down water closet to be supplied through 1/2" nickel plated pipe with nickel plate flange with intersection with floor, each tank shall be lined with 12 oz. copper; wood casing of tank, seat and lid shall be of finished oak. The closet shall be equal to Fort Pitt Supply Company's "Rubico" Plate 1229, of their catalogue or its equivalent, if approved by the Engineer of the Water Company.

WASH BASIN

Furnish and set up in lavatory one wash basin with 24 x 20" dark knox marble slab with 8" back. Pipe for hot and cold water through 1/2" nickel plated supply pipes with nickel plated brass compression cocks. The waste through nickel plated 1-1/4" trap, to be supported with nickel plated steel brackets or legs, with nickel plated chain, stopper and strainer. The wash basin to be equal to Plate 1168 in the catalogue of the Fort Pitt Supply Company of Pittsburg.

PAINTING

All exterior wood work, unless otherwise specified, shall receive a priming coat as soon as in place and the window and door frames as soon as they have been inspected. All exterior wood work shall finally receive three coats of paint made of pure linseed oil and white lead, of the color to be selected by the Engineer of the Water Company. All exposed interior wood work shall be finished in natural colors with one coat of filler and three coats of hard oil finish. All knot holes and pitchy places must be shellaced before painting. All nail holes and other places

shall be putty stopped after the first coat. All iron work, both inside and out, to be thoroughly cleaned of all grease, dirt or mill scale, and then shall be painted with best graphite or carbon thoroughly mixed with linseed oil.

GLAZING

All glass used throughout the building shall be "AADS" American Window Glass. All windows and transoms to have the number of lights shown on elevation plans. All glass to be back puttied and bradded in and left whole on completion of the building.

The above building shall be enclosed within sixty days of signing of the contract and finished within ninety days of the signing of the contract.